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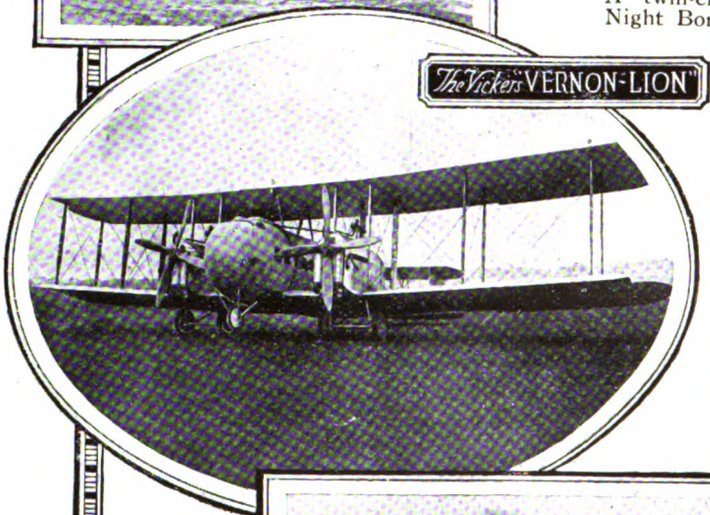

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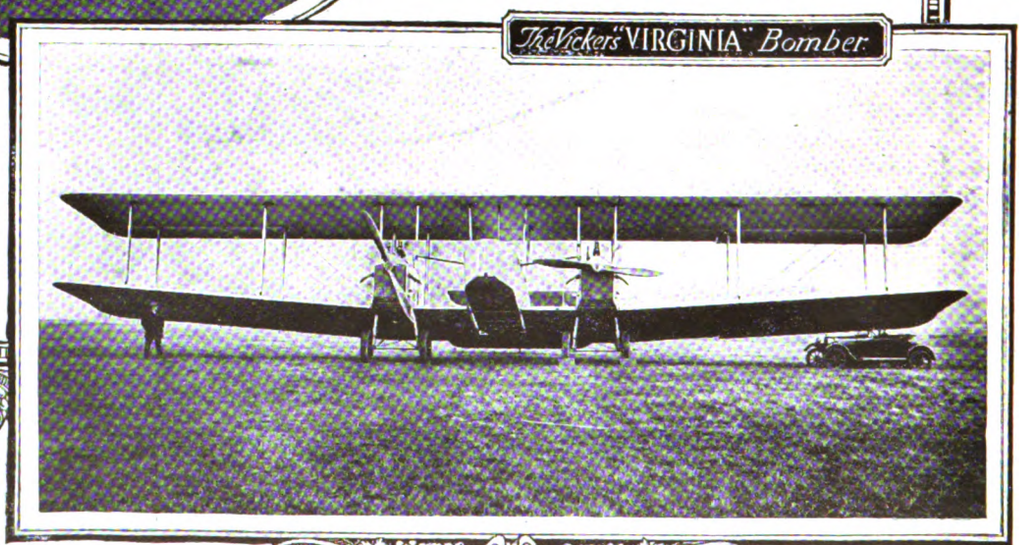

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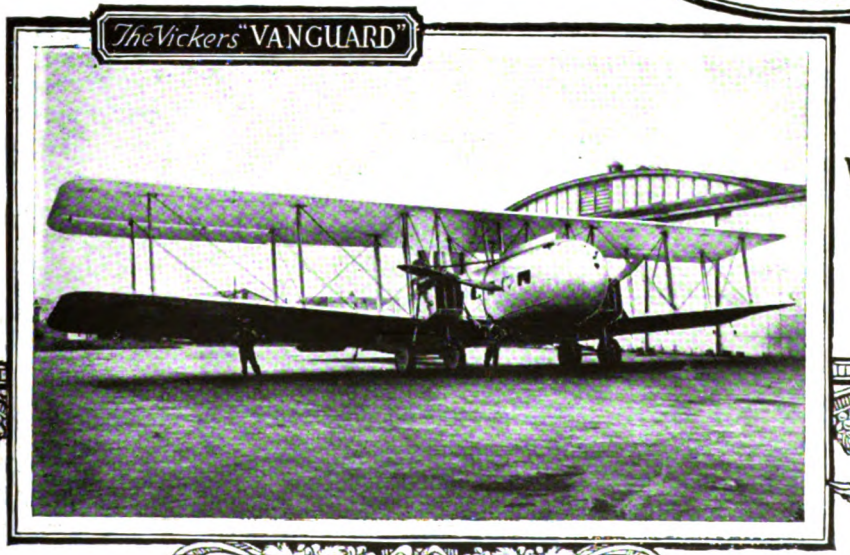

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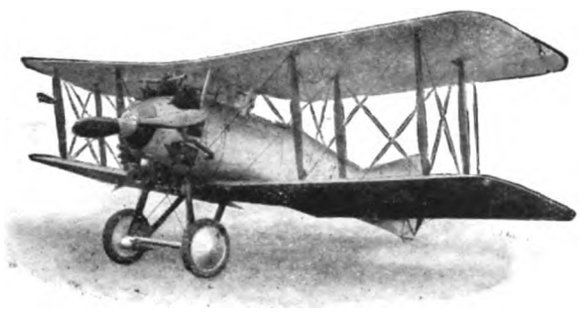

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completed the Two-Hundrec
1 hour, 2 minutes, 23 second
speed of 192.4 miles per hou
the course included several sh
West Thurrock and Croydon
very appreciably, it is evidcn
been considerably exceeded du
Actually, Mr. Carter crossed
220 miles per hour—proving u
British aircraft design.

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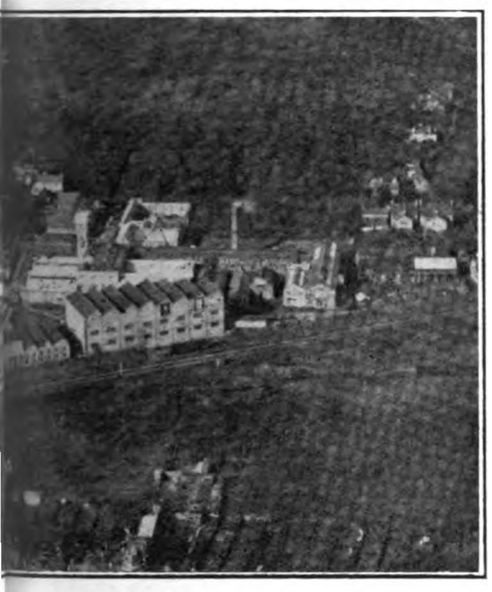

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onstructional work is carried out.

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THE machine is a beautiful piece of work, and the compactness with which it folds is extremely attractive.

The Aeroplane,
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1923.

achievement during the past
plied science has been the
inner of the Aerial Derby on
the Gloucestershire Aircraft
Larry Carter, the machine
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When it is remembered that
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ne at the stupendous speed of
ably the progress achieved in

"Conquest," Sept. 1923.

MARS VI (with Jaguar Engine).
(Single-Seater Fighter.)

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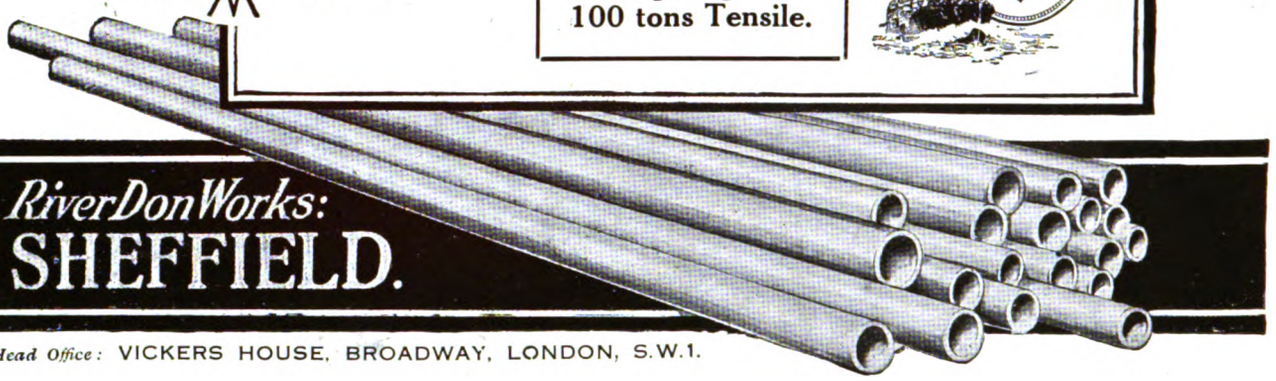

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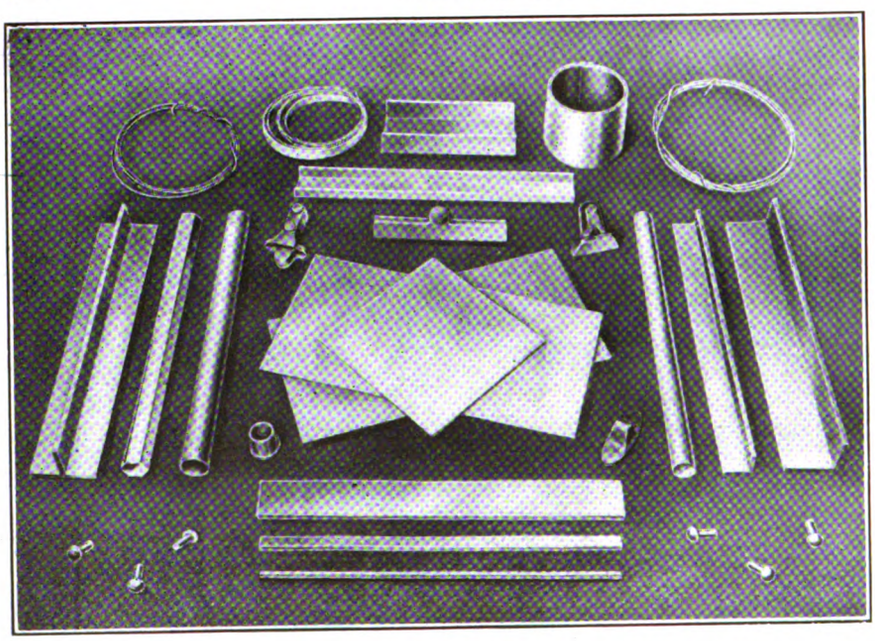

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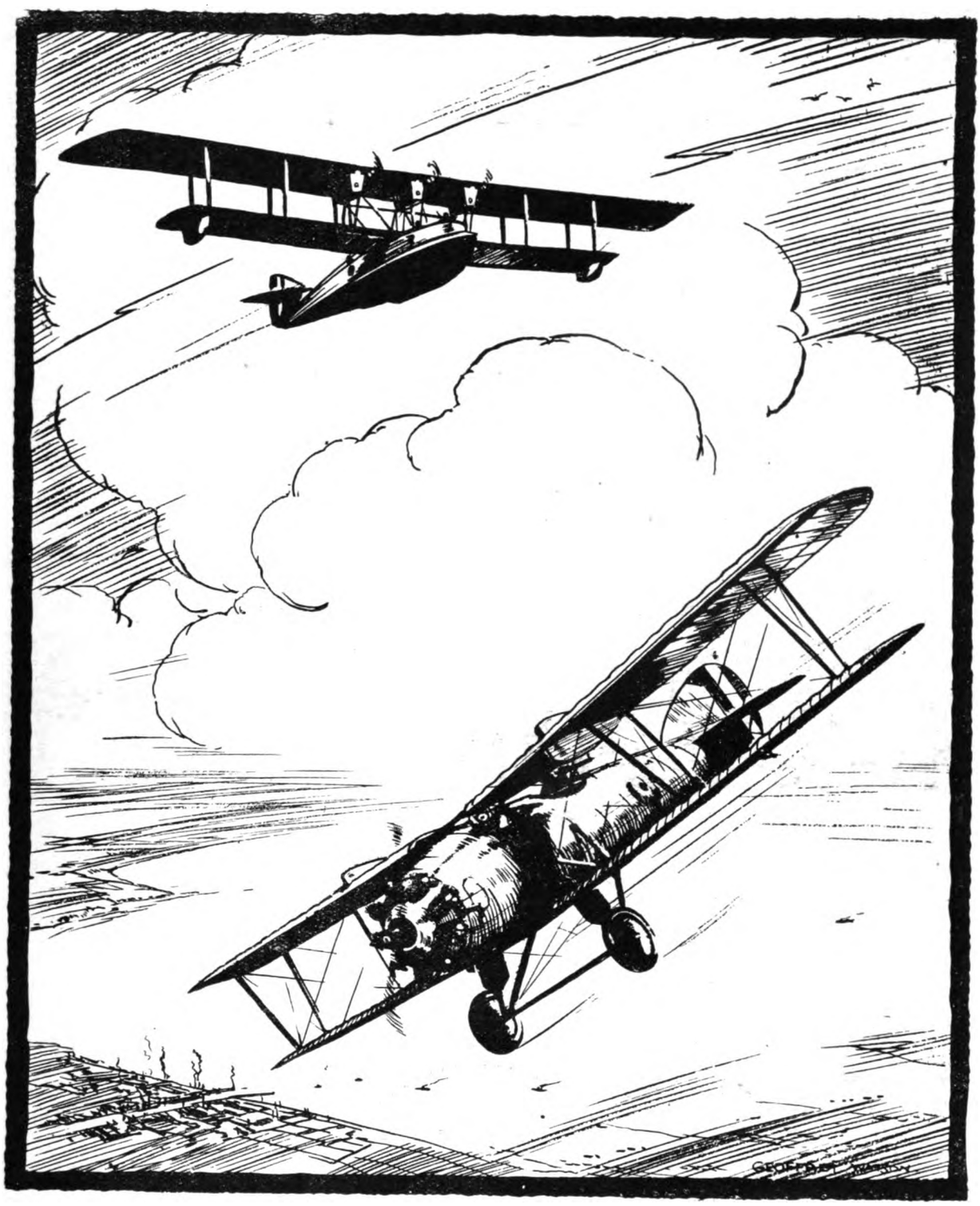

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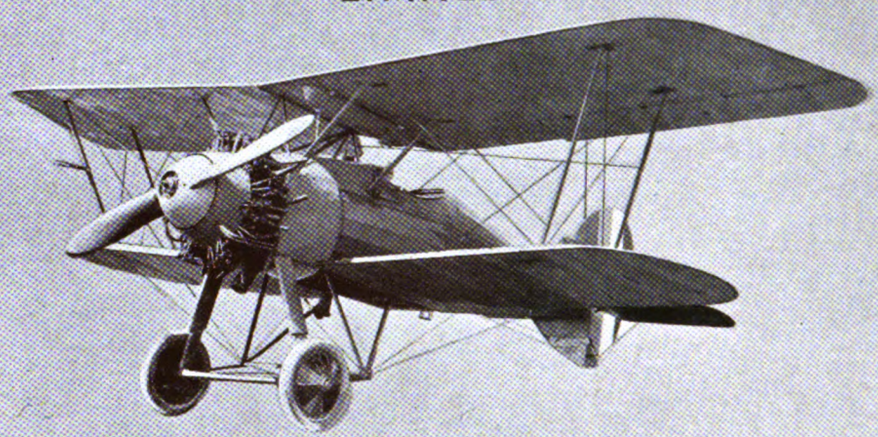

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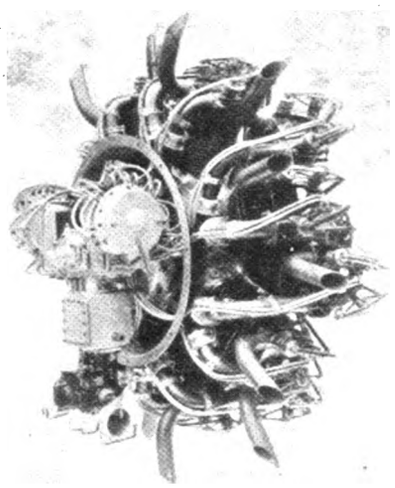

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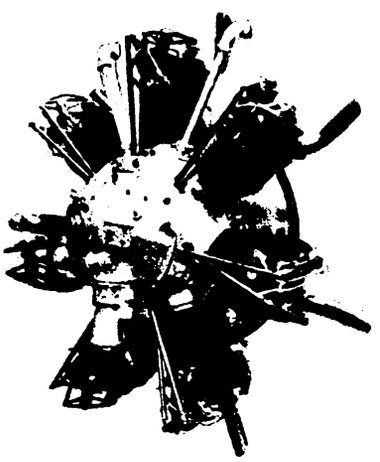

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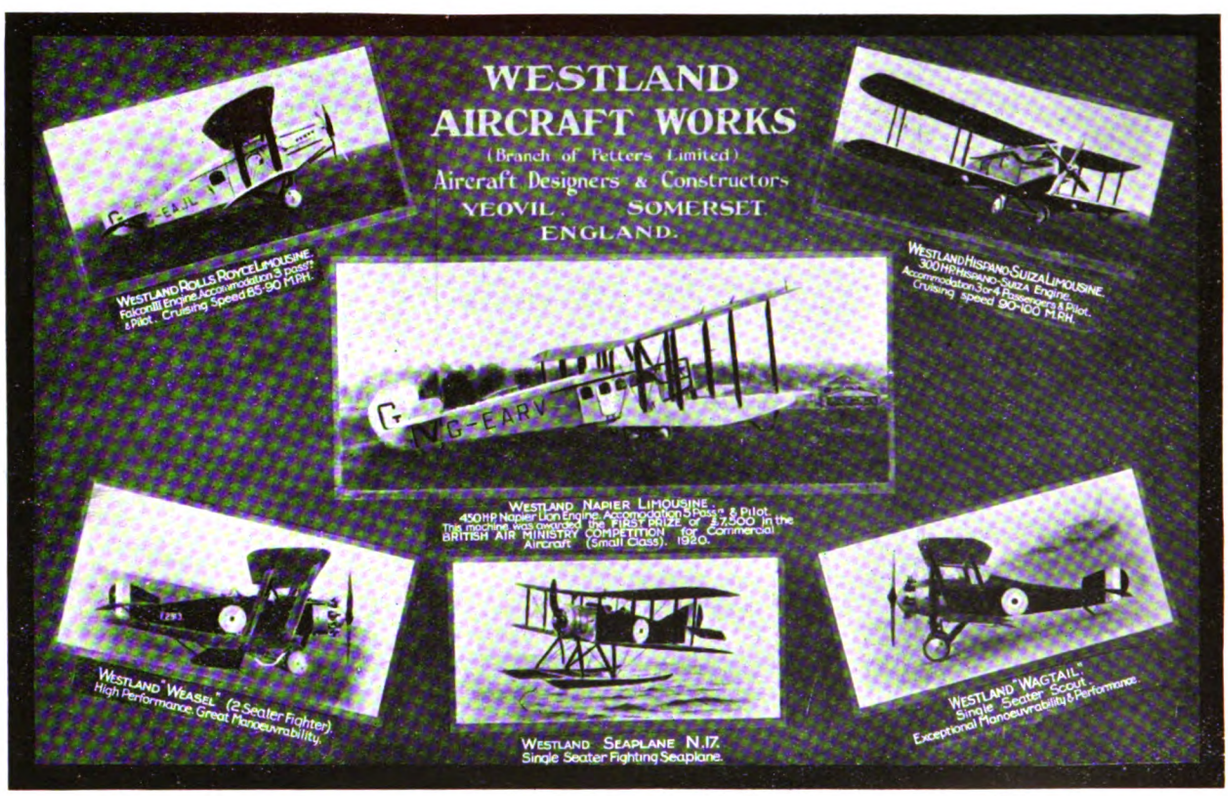
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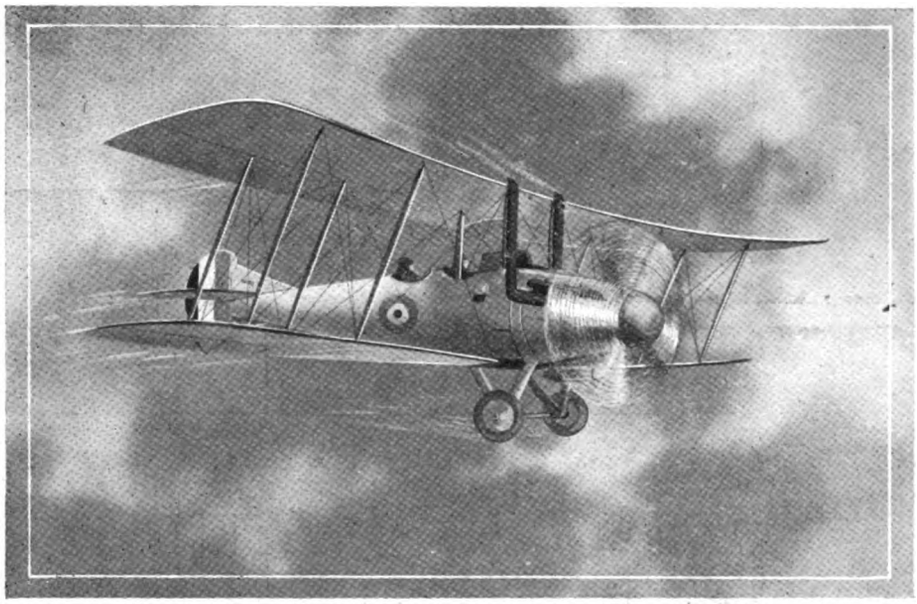

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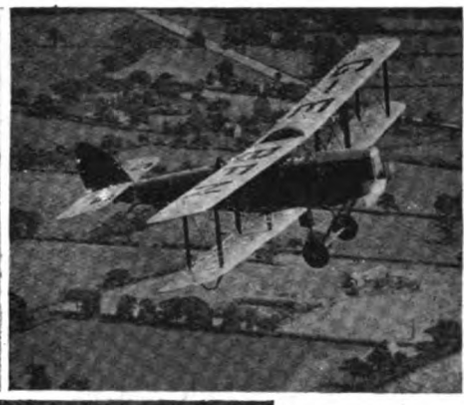

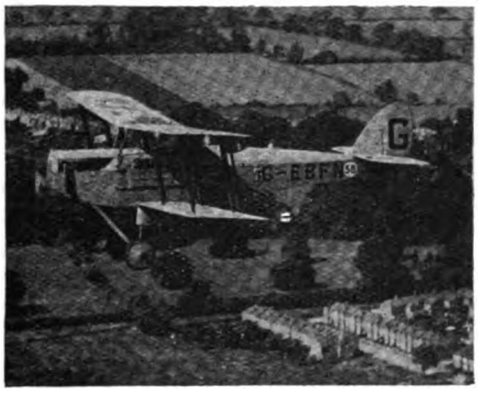

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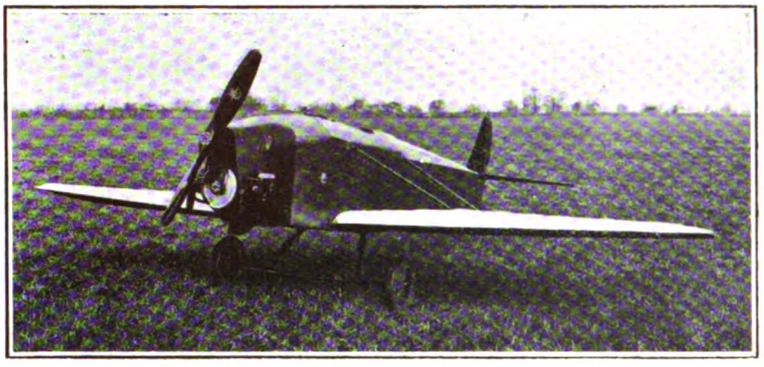

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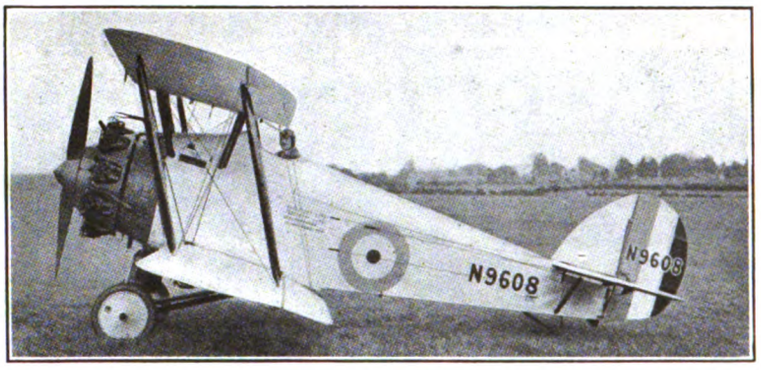

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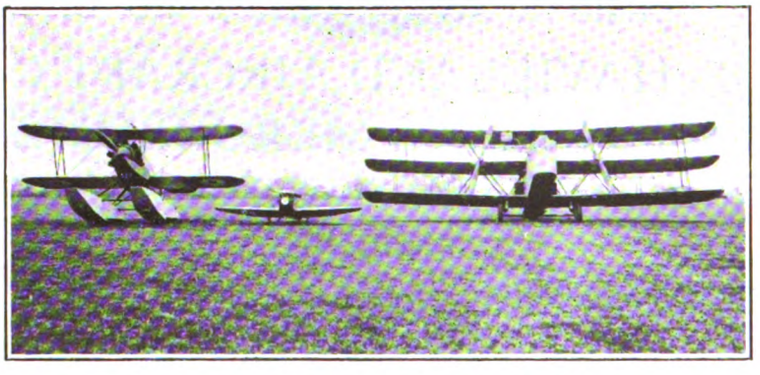

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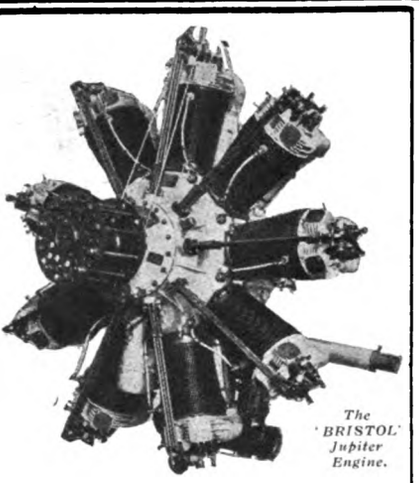

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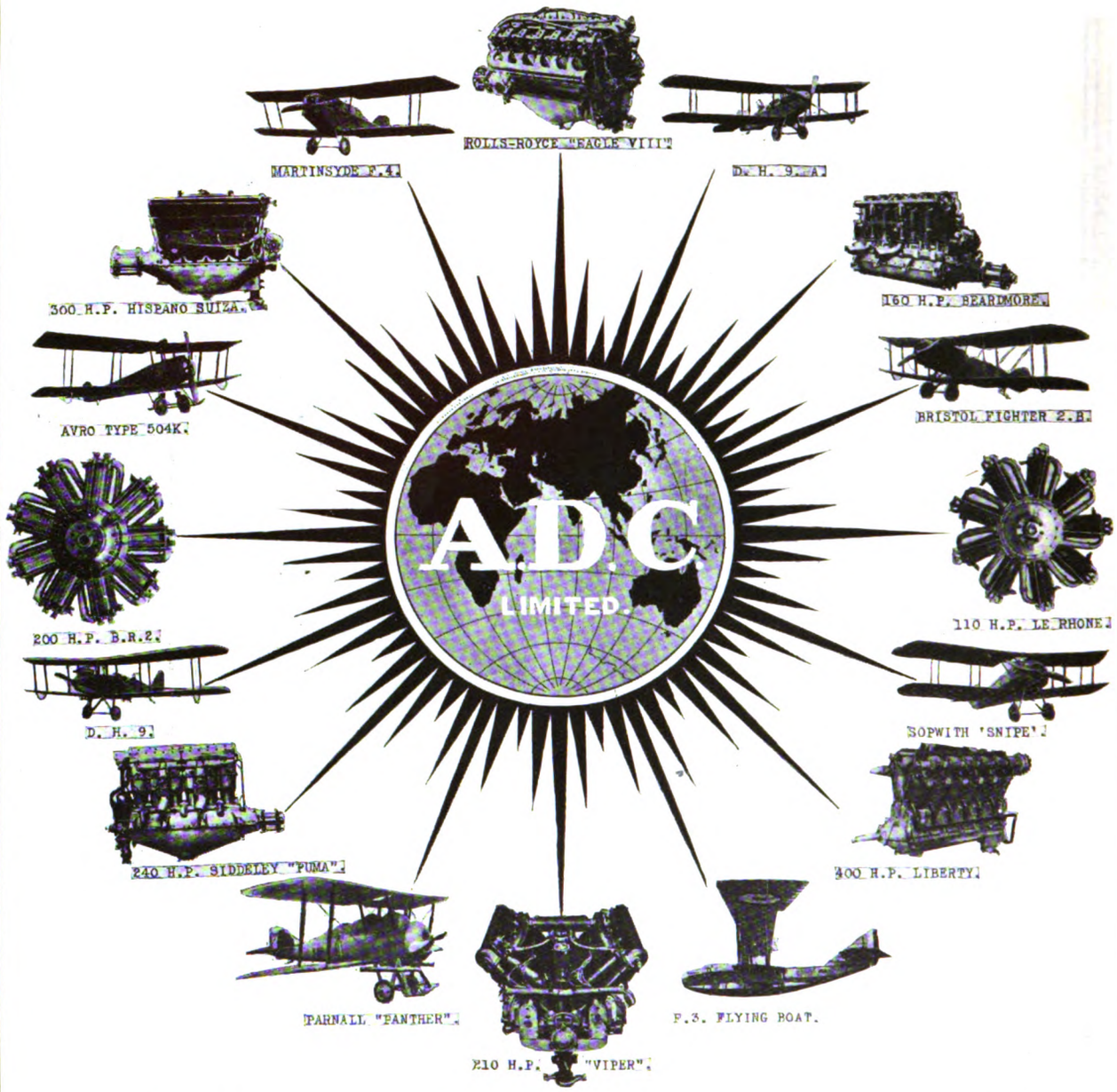

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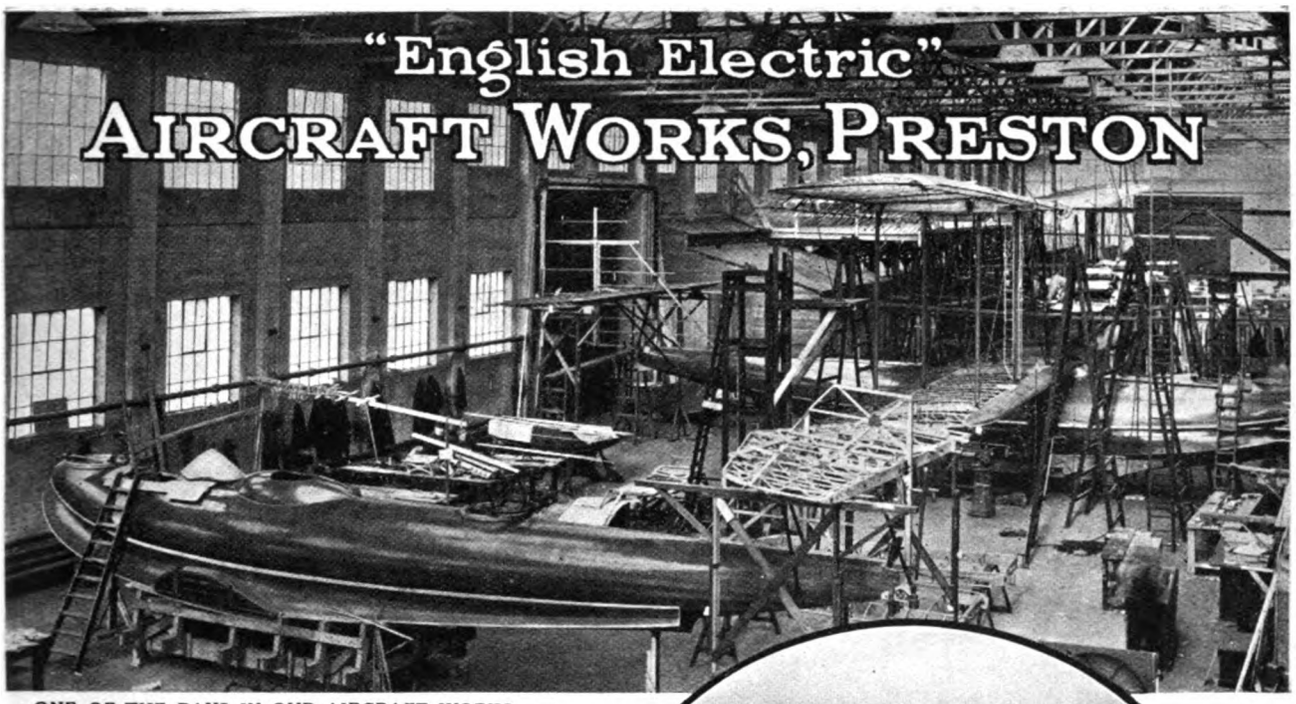

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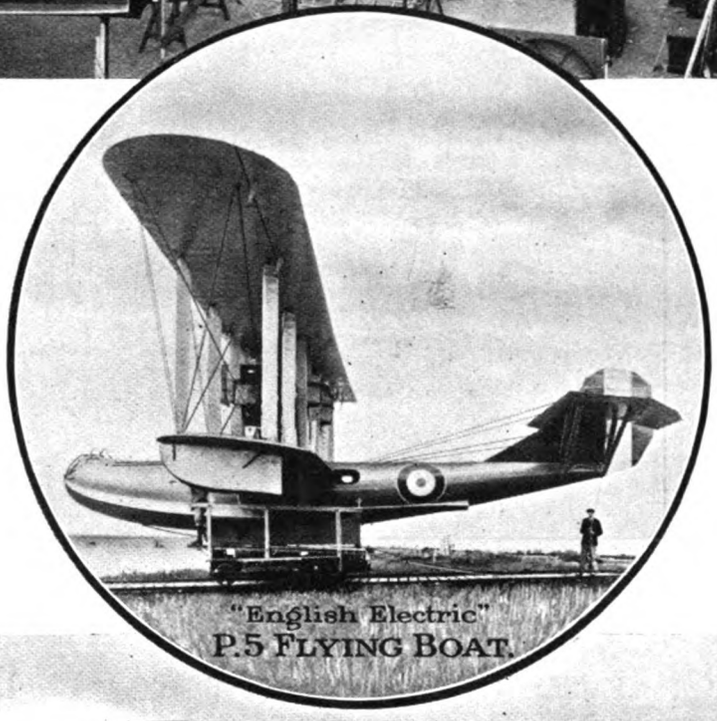

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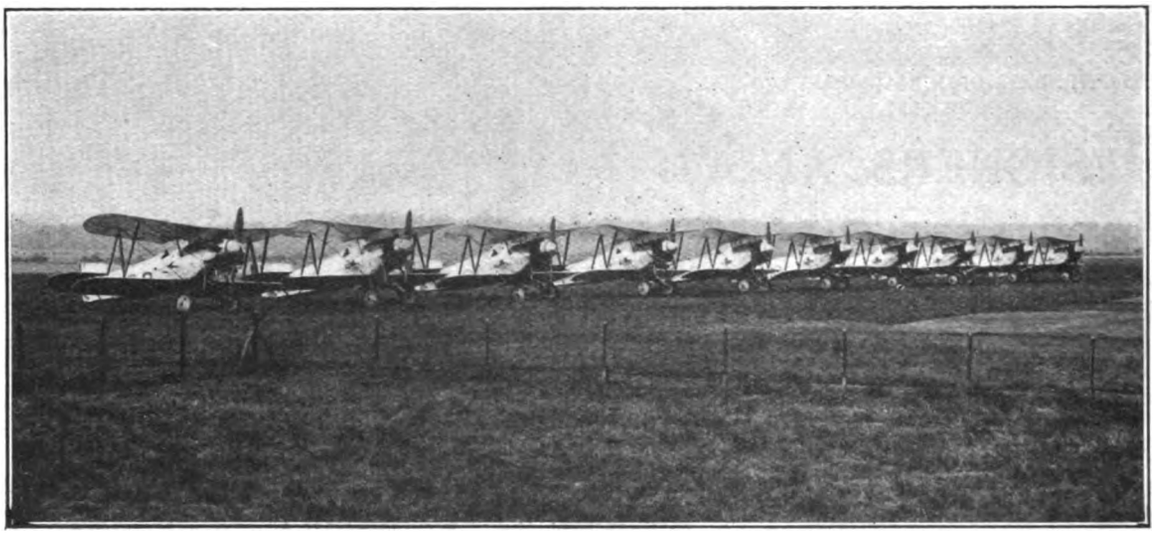

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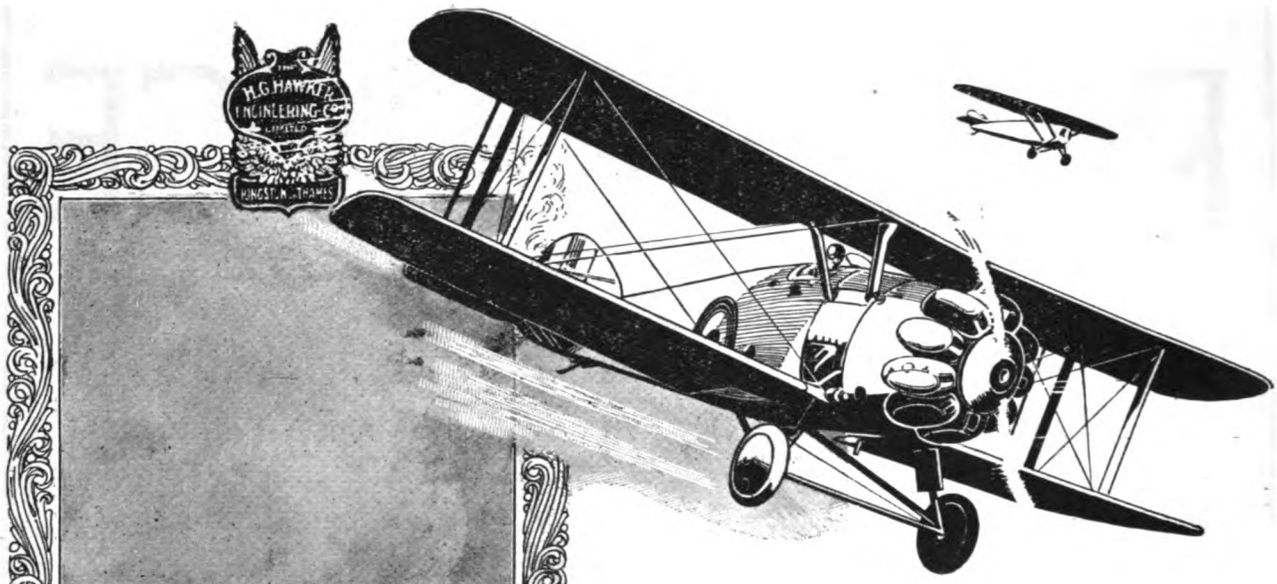

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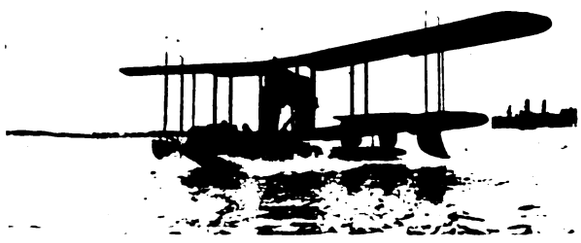

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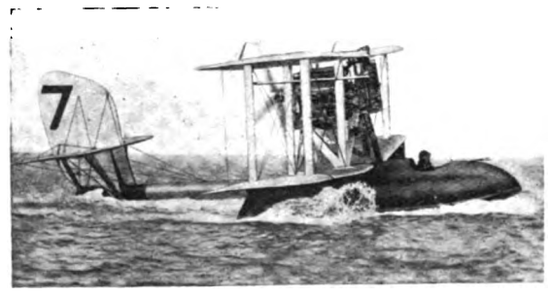

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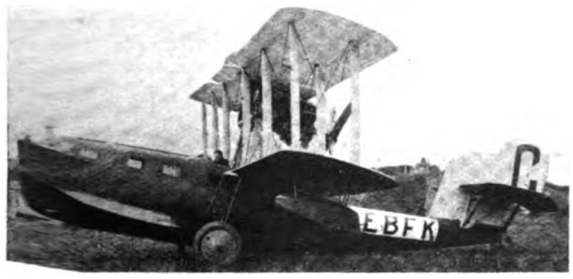

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August. I.L.U.G. Gothenburg. Fokker DC.I. awarded the FIRST PRIZE for acrobatic flying. SECOND PRIZE in the "Schedule Flying" between Rotterdam and Gothenburg.

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December. A standard series Fokker D.XI breaks the Spanish Height and Speed Records (8,800 metres, 262 km/hr.).

1924.

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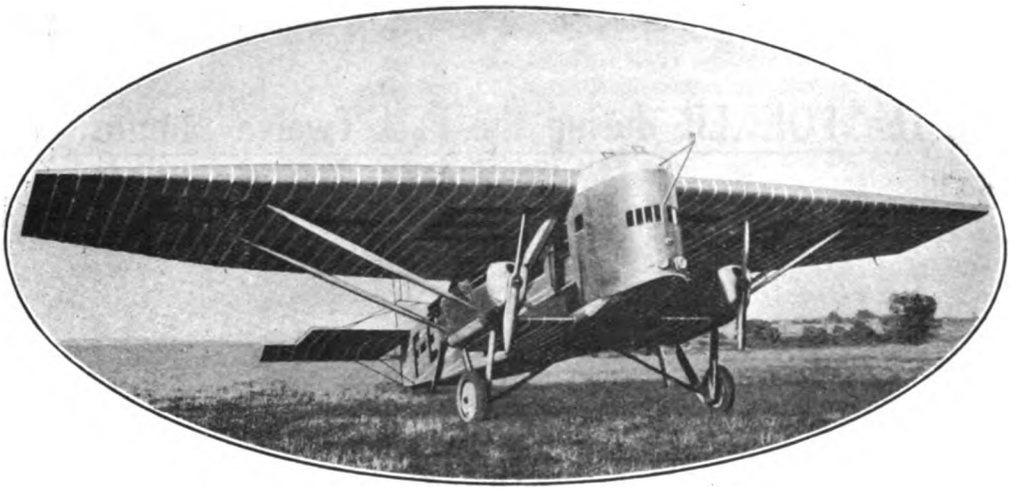

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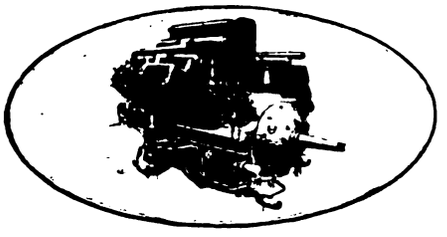

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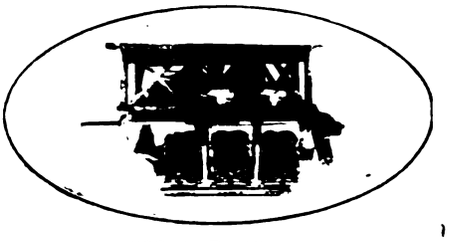

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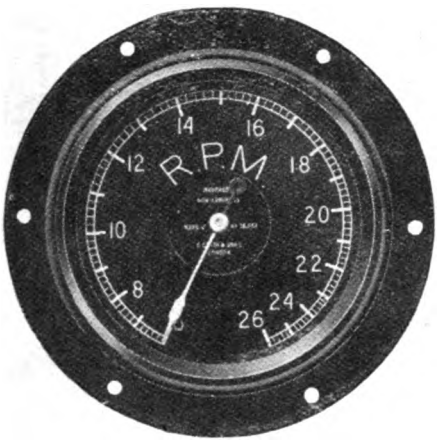

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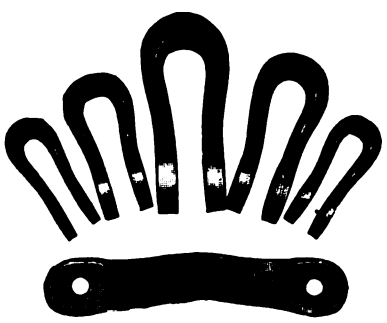

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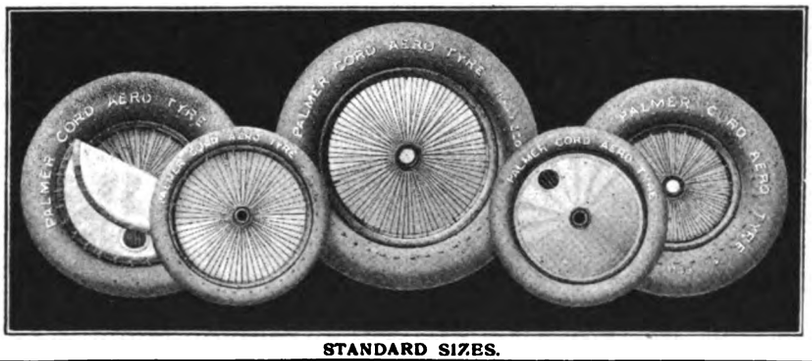

STANDARD SIZES.

Tyre Size	Wheel No.	Hub Length	Hub Bore	Track Line
		m/m	m/m	m/m
300 × 60	16	111.12	25.4	Central
,,	17	72.39	12.7	Central
450 × 60	30	89.	31.75	Central
,,	138	130.	38.09	Central
575 × 60	21	160.	28.	Central
,,	34	150.	31.75	104/46
,,	111	150.	38.09	104/46
600 × 75	21	160.	28.	Central
,,	34	150.	31.75	104/46
,,	111	150.	38.09	104/46
700 × 75	78	178.	44.45	132/46
,,	79	178.	44.45	Central
,,	100	178.	38.09	132/46
,,	101	178.	31.75	132/46
700 × 100	77	178.	44.45	132/46
,,	92	185.	55.	135/50
,,	95	185.	55.	Central
,,	96	178.	55.	132/46

Tyre Size	Wheel No.	Hub Len	Hub Bore	Track Line
		m/m	m/m	m/m
700 × 100	99	178.	38.89	132/46
,,	112	150.	38.09	Central
650 × 125	119	178.	55.	132/46
750 × 125	77	178.	44.45	132/46
,,	92	185.	55.	135/50
,,	95	185.	55.	Central
,,	96	178.	55.	132/46
,,	99	178.	38.89	132/46
,,	112	150.	38.09	Central
800 × 150	82	185.	55.	135/50
,,	85	185.	55.	Central
,,	161*	185.	55.	135/50
,,	211*	185.	60.32	135/50
,,	152	185.	66.67	135/50
,,	163*	185.	66.67	135/50
1000 × 150	131	220.	66.67	Central
,,	102	185.	55.	125/60
,,	141	250.	80.	Central
,,	201	185.	60.32	125/60
,,	150	185.	55.	Central

Tyre Size	Wheel No.	Hub Len.	Hub Bore	Track Line
		m/m	m/m	m/m
1000 × 150	210	185.	60.32	Central
1000 × 180	148	220.	80.	Central
,,	149	185.	55.	Central
,,	155	220.	66.67	Central
900 × 200	107	185.	55	Central
,,	108	185.	55.	125/60
,,	128	220.	66.67	Central
,,	137	250.	80.	Central
	202	185.	60.32	Central
1100 × 220	134	220.	66.67	Central
,,	136	250.	80.	Central
1250 × 250	133	250.	80.	Central
,,	154	304.8	101.6	Central
1500 × 300	115	304.8	101.6	Central
,,	126	304.8	152.4	Central
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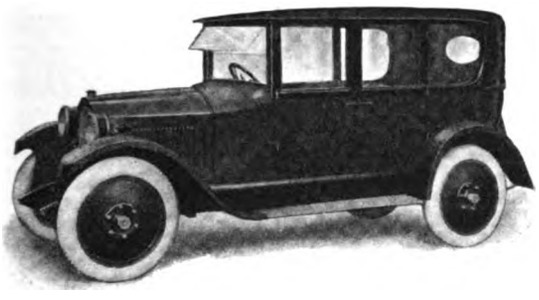

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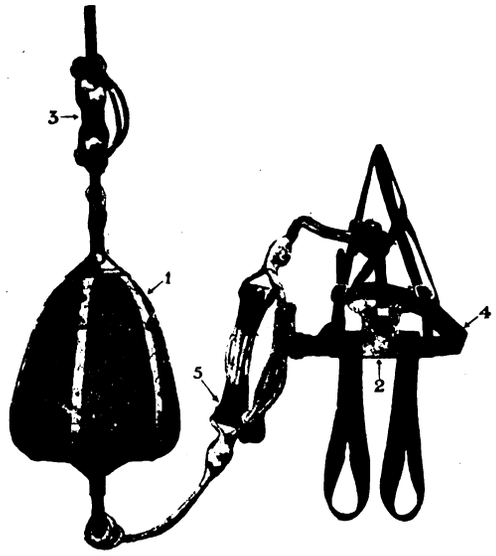

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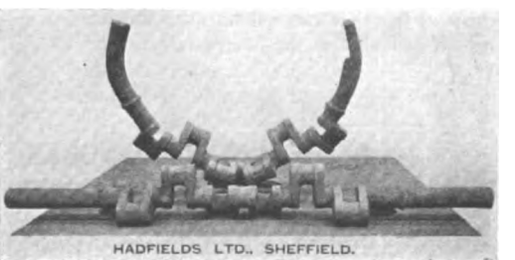

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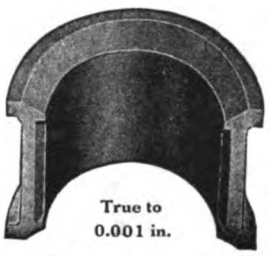

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ALL THE WORLD'S AIRCRAFT.

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FOUNDER AND EDITOR OF "FIGHTING SHIPS" (ANNUAL) ETC.

COMPILED AND EDITED BY

C. G. GREY

Editor of "The Aeroplane."

PART A.—THE WORLD'S AERONAUTICAL PROGRESS.

PART B.—ALL THE WORLD'S AEROPLANES.
(INCLUDING SECTIONS ON HELICOPTERS AND GLIDERS).

PART C.—ALL THE WORLD'S AERO-ENGINES.

PART D.—ALL THE WORLD'S AIRSHIPS.

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PREFACE.

By C. G. GREY (Editor of *The Aeroplane*).

FOR this, the fourteenth, issue of *All the World's Aircraft* it can be claimed with more than the usual justification that it is an entirely new volume, for the form as well as the contents is new. It is hoped that readers will agree that the book in its new form is more convenient to handle, more easily stored and less easily damaged. Also most readers will probably find the long two-column page more comfortable to read than the shorter columns of the earlier issues.

As to the contents, readers will discover more new aeroplanes than ever with which to assuage their appetites for technical information, they will find a number of new engines and—perhaps most unexpectedly of all—a new German Zeppelin airship, built as a " reparation " for the United States.

From the point of view of general aeronautical progress, it is satisfactory to find that several countries which have built no aeroplanes since the War, 1914-18, now appear among the producing nations. Notable among these are Hungary and Roumania. Also, countries which before the War built no aeroplanes and built but few during the War appear in this volume as quite important producers. Particularly important in this respect is the number of new types of aeroplanes designed and built in Holland and in Czecho-Slovakia.

SERVICE AVIATION.

A point to be noted is that though some slight progress is shown in the production of new types of aeroplanes for civil aviation, both big passenger-carriers and small sporting single and two-seaters of the species known as " light aeroplanes," very much more progress is shown in the production of new types of aeroplanes-of-war. Those who are pacifically inclined will doubtless hope that this is not a straw showing which way the wind blows.

Apropos Service as differentiated from Civil Aviation, the Historical Section of this volume contains a large amount of information concerning the Flying Services of various nations which hitherto has been unobtainable. One believes that for the first time in any language the full organisation and disposition of the Army Air Services of France and the United Services are published herein. The Italian *Regia Aeronautica*, which, like the British Royal Air Force is a Third Service independent of the Army and Navy, is also described fully for the first time. These three great Flying Services, which with the R.A.F. are the biggest in the world—and will remain so till the new Japanese and Russian aeronautical programmes are completed—will be found of particular interest by those who have any suspicion that War is unlikely to occur again.

BRITISH PROGRESS.

In his article (following this) on Technical Progress, Captain Sayers has shown that foreign nations surpass us in the speed of their best aeroplanes. But we can claim that in warlike equipment our Royal Air Force is still ahead of all rivals, in that our sea-going, deck-flying, bomb-dropping and torpedo-dropping aeroplanes surpass those of foreign nations. Nevertheless, it is time for us to look carefully into the effectiveness of the R.A.F., for France, Holland and the United States all possess fighting machines with better performances than any of our own make which are actually in the possession of the R.A.F. Our position is rather that of a nation having a Navy with a preponderance of battle-ships when its rivals have a much greater number of fast battle-cruisers.

In Parliament during the past year it has been shown that all political parties, from the ultra-pacifists of the Labour Party to the most warlike of Conservative Die-Hards are determined that we shall have the best possible Air Force. The Air Ministry has had voted to it all the money that it requires at the moment. Nothing has stood in the way of our having the World's Best Air Fleet except the obstinacy of a few technical experts at the Air Ministry who have used their positions to impose their own ideas on designers who have been building aeroplanes for the R.A.F. The whole Technical Department at the Air Ministry has recently been re-organised and signs of remarkable improvements are already becoming evident.

In Civil Aviation the most remarkable event has been the fusion of the four cross-Channel air lines into one combine, to which has been given a monopoly of all Government subsidies allocated to Civil Aviation, amounting to £1,000,000 spread over ten years. Owing to a dispute with such civilian pilots as were available and the inevitable delays of re-organisation and to permanent bad weather, the passenger traffic of early 1924 has been considerably less than that of early 1923, but at the moment of writing a marked increase is noticeable.

In spite of all hindrances, or perhaps because of all its hindrances, the British Aircraft Industry has, on the whole, more than held its own against all competitors, especially in selling aeroplanes abroad. The high reputation always held by British manufacturers for the quality of material and workmanship is being adequately upheld by British aircraft constructors. And the pages of this volume describing aeroplanes built by foreign nations show by the number of machines to which British engines are fitted that our aero-engines are regarded as being of the highest class.

FOREIGN PROGRESS.

In France a vast number of new military aeroplanes with excellent performances have been built. They will be found described in detail in their proper places in this volume. A comparison of their figures for speed and climb with those of British machines actually in service is not encouraging to our self-complacency. But we can console ourselves with the thought that we can and shall accomplish in due course all that the French constructors have accomplished and that their temporary superiority is due only to the fact that the French Government has accelerated its building programme in the past two years while our Air Staff has been laying solid foundations for the personnel rather than the materiel of the Royal Air Force.

French Civil Aviation has shown little progress in 1923-24, and few new commercial aeroplanes of any value have been produced in that country. The large sums spent on subsidising Civil Aviation during the

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past two or three years have been singularly unproductive.

In the United States the early policy of encouraging the Trade by ordering racing machines for the Army and Navy has produced some wonderful aircraft, but this policy has now been abandoned and the official scheme now seems to be to wreck the Trade by ordering experimental machines only, without giving any orders for production such as would keep the factories at work, and to set up Government factories on the lines of Naval dockyards.

Those who remember the dire results which followed a similar policy in England just before the War, 1914-18—when our War Minister of the period boasted that " the best brains in the country " were assembled in our Royal Aircraft Factory—will understand the feelings of the American Trade and of the more intelligent Service aviators.

Germany is still suffering from the efforts of the *Commission Aéronautique Inter-Alliée* to ruin German aviation. In spite of this, many interesting small aeroplanes (of the size permitted by the French interpretation of the Versailles Treaty) have been produced in Germany and many big aeroplanes have been designed and built by Germans outside Germany. Also, the German scientists and experimenters have done much valuable work which will all eventually help the renaissance of German aviation.

Italy has produced little of interest in 1923-24, so far as aeroplanes are concerned. But the formation of the *Regia Aeronautica*, to which one has referred, will soon produce new and valuable aircraft, much as the formation of the R.A.F. as an independent fighting Service has stimulated the production of new types in England.

THE EASTERN MENACE.

Russia is now coming to the front as possessing a Flying Service which must be taken into consideration by the Powers of civilised Western Europe. Little definite information is obtainable concerning aeroplanes of Russian design and construction. But it is known that their designing has been done and their factories have been organised by German aeronautical engineers who have been driven out of their fatherland by the French attempts to crush German aviation. The Red Army of the Union of Soviet Republics, as the Army of His Imperial Majesty, the late Emperor of Russia, is now called, is already the biggest and the most fiercely disciplined in the world, and the Russians are determined that the Soviet Air Fleet shall dominate the Western Bourgoisie just as the British Fleet once dominated the Seven Seas. An immense propagandist campaign in favour of a great air fleet has been carried on in the official Soviet newspapers for the past two years or more.

The information published in the Historical Section of this book concerning the Russian Air Fleet will show how great is the danger which is growing in that direction.

This danger is all the greater because the military defences of the States which should form a barrier between Russia and civilised Europe are so weak. France has endeavoured to bolster up a barrier of such States from the Baltic to the Adriatic. She has made big financial loans to Czecho-Slovakia, Poland, Roumania and Jugo-Slavia on the condition that with the money lent these States are to buy army equipment and aircraft from France. If the defences thus established do in any way delay the Russian advance into Europe when the Bolsheviks are prepared we in this country will certainly not grudge the fact that these loans were made out of the money owed by France to England, or owed by France to America on England's guarantee.

But from what one can gather, neither Poland nor Roumania are likely to put up any kind of a fight against Russian aggression. Czecho-Slovakia is just as likely as not to join with Russia, because of the Slavonic origin of so many of its inhabitants. Bulgaria will certainly join with Russia. And so there will be a free passage for the Red Army through defenceless Hungary from Moscow to Vienna.

The Jugo-Slavs may or may not join with the Russians. Their Slavonic origin gives them pro-Russian tendencies, but it is possible that their Government may have pro-Western tendencies. In any case, neither their Army nor their Air Force is strong enough to resist the Red Army's progress.

HISTORICAL CONSIDERATIONS.

In considering the Historical Section of *All the World's Aircraft*, the reader should always have in view the relation of the various Air Forces of Western and Central Europe to the development of aviation in Russia. Whatever may be read in the newspapers, there is no doubt that the General Staffs of the Western Powers, including Germany, have in view an invasion by the Oriental peoples from the East of Warsaw.

In this connection it is well to consider that no army from the East could ever pass through the Alps and that in order to enter Western Europe such an army must either pass through Germany or through Northern Italy. Thus, in repelling such an invasion, the French and Italians can hold the line from the Alps to the Adriatic, and the various Anglo-Saxon, Scandinavian and Teutonic nations can hold the line from the Alps to the Baltic. In this way French and Germans can fight on the same side, though not side by side.

It may perhaps be held by some readers of this preface that a technical publication such as *All the World's Aircraft* is not the proper place for either a political or strategic dissertation. To such critics one would reply that a study of the volume will show the immense preponderance of military machines in all countries over civilian machines. This is a direct indication of the fact that all these nations are organising their aviation with a view to the great war of the future. Which shows that Military Aviation is regarded as the necessity of the moment, whereas Civil Aviation may be left to develop or, as Mr. Churchill put it, " to fly by itself " when the ordinary business man discovers that it can be of use to him.

THE WAR IN THE PACIFIC.

One should also refer here to the war which in due time must occur between the United States and Japan for the mastery of the Pacific. It is very probable that Imperial Japan will find itself allied with Russia. Such an alliance would be no more unnatural than was the alliance between the British Empire and the Republics of the United States of America and of France in the War 1914-18. And there is more than a probability that when the war between Europe and Russia begins Russia will be an empire under an upstart emperor, as France was under Napoleon Bonaparte.

In any case, we shall be concerned in the war between Japan and the United States, in that Japan's first effort must be to capture the Philippine Islands and from them to capture the Dutch oilfields in the Malay Archipelago. We shall be compelled to help the Dutch and Americans in preventing this. And then the much-debated Singapore Base will be the strategic key to the whole of that war in that from it our aircraft will control the passage of enemy ships through the

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channels between the islands which stretch in one continuous chain from Singapore to Port Darwin, the northermost point of Australia.

Little will be found about Japanese aviation either in the Historical Section of this book or in the Technical Sections. The Japanese refuse all information about their Flying Services, and their development is taking place with the greatest possible secrecy. It is impossible for the Japanese to hide what they are doing, but they place every possible official hindrance in the way of obtaining information.

All that can be gathered is that the Japanese Army Air Service is being developed on an enormous scale along the lines of the French *Service d'Aviation Militaire* and that the Japanese Naval Air Service is being copied as closely as possible from the Fleet Air Arm of the Royal Air Force.

The basis of Japanese Naval Aviation was laid by a mission composed of former officers and men of the Royal Naval Air Service and R.A.F. who went to Japan in 1921 and organised the whole air training system for the Japanese Navy.

Japan is seeking knowledge from all possible sources, and it is significant that the Japanese are the largest purchasers in the world of all aeronautical literature published in this country or in the United States or in France or in Germany. This is a matter which does, of course, directly concern not only the readers but even more the publishers of such a work as *All the World's Aircraft*.

BALTIC AVIATION.

The progress of aviation in the Baltic States is steady, but not so rapid as it has been during the preceding two years, in which it grew from nothing to quite considerable proportions.

There is still no precise indication as to the part which the Air Forces of Lithuania, Latvia, Esthonia and Finland will play in the Great Race War. But there is always the hope that their racial origin may lead them to the side of Western Europe. One can at any rate again congratulate the authorities of these States on the businesslike way in which their Staff work is done, as shown in the course of one's correspondence with them.

THANKS WHERE DUE.

Once more one desires to thank the various Military, Naval and Air Attachés at the Embassies and Legations in London, as well as the officials at their respective Head Quarters in their own countries, for their almost universal courtesy and promptness in sending information for this volume. In the few instances in which requests for information have been received with discourtesy or have received no attention at all, such lack of courtesy has been more or less what one expected, on the principle of the ancient proverb that from a pig one can only expect a grunt.

The correspondence with officials of various foreign nations entailed in the compilation of this work affords a most amazingly interesting insight into the manners and customs and psychology of those nations. In fact, the mere refusal of information by some countries may, when the next war occurs, be of greater value than are the pleasingly voluminous communications received from other countries.

GENERAL PROGRESS.

From the purely technical point of view, it will be found that very great improvement has been made in the efficiency of aeroplanes. And much of this improvement is certainly due to the examples set during the past year or two by the light or low-powered aeroplanes produced in England and Germany.

People argue quite reasonably that if one man can be carried safely and comfortably by 10 horsepower, a matter of 150 horsepower or so ought to be able to carry ten people at the same speed, and that something like double the same horsepower should raise that speed to a reasonable cruising speed for commercial aircraft.

We are steadily working in that direction and away from the idea that it is sufficient if eight passengers are transported by something over 400 horsepower. Probably we shall in the end come down to something like 15 h.p. per passenger for a cruising speed of about 150 m.p.h. At those figures air transport may become a commercial proposition.

Gliders are practically extinct. But light aeroplanes are being adopted, at any rate experimentally, by the R.A.F. for training purposes. Nevertheless one does not believe that the very low-powered light aeroplane will ever become a vehicle commonly used by private owners. The privately owned aeroplane is always more likely to be in the class of the yacht than of the dinghey with an " out-board " engine.

THE COMIC CLASS.

Among what might be irreverently called the " comic " class of flying machine, such as helicopters, ornithopters, orthopters, gyropters and so forth, there is little real progress to report. One or two people on the Continent have succeeded in getting helicopters off the ground and round a closed circuit of a kilometre or so at a height of a few feet. But there is little to show in the direction of real navigability. And there is still less to show in the direction of getting such machines down in the event of engine stoppage, though it is quite easy to get them up so long as the engine is pulling well.

Possibly by the time this appears in print we shall have heard glowing accounts in the press of the performances of that helicopter on which the Government has already spent many tens of thousands of pounds at Farnborough. Without having seen the machine and knowing practically nothing about its design, one is prepared to stake one's reputation against its achieving any real success.

ENGINES.

In the Engine Section there is again little notable progress to report. Such progress as has been achieved is rather in the direction of increasing the reliability of existing engines than in the production of actual new types.

Nevertheless, this increase in reliability is probably better for the progress of aviation than would be the production of a number of interesting freaks. The heavy oil semi-Diesel engine predicted in last year's volume is still in the experimental stage, but promises well.

AIRSHIPS.

The Airship Section is chiefly interesting because of the appearance of a brand new German-built Zeppelin, the price of which is to be considered as part payment of Germany's reparation money to the United States. This will probably prove to be the world's best airship for the next two or three years. Meantime, it is interesting to note that the British Government has now decided to encourage the building and running of airships.

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TO CRITICS.

For yet another year one would like to thank the various critics of the last volume of *All the World's Aircraft* for the very valuable advice which they have tendered. And one would again ask for criticisms of this current volume. Continual improvement can only be made with the help of critics, kindly or unkindly.

It will be found that the standardisation of forms of specifications of aircraft is being achieved. In such a volume as this it cannot be done all at once, except at such expense as is not justified by the present financial state of ventures in any branch of aeronautical activity.

One will be grateful to readers who will point out any errors of commission or omission, though it will probably be found that the errors of omission are in the main due to information being unobtainable.

Once again one has had the valuable assistance of Captain Sayers and Mr. Bridgman in compiling this volume, and to them one attributes all praise due for the technical accuracy and the illustrations of this work.

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A REVIEW OF PROGRESS IN 1923.

By W. H. SAYERS (Captain, Late R.A.F.).

THE two most noticeable achievements in aeronautics of 1923 have been connected with the sporting side of flying. The extraordinary jump in the speeds attained by racing machines in America, where the world's speed record has been raised to the remarkable figure of 266 m.p.h., and where some half-dozen machines, all of them of speeds of 230 m.p.h. and over, were produced for the Pulitzer Trophy race may be regarded as proof that the then phenomenal speeds attained in that country a year before were the result of no lucky chance, but that American aircraft constructors have in fact made very great advances in the technique of design for abnormally high speeds.

The appearance at Cowes of the two 1921 Navy Curtiss Racers fitted with floats, and their unchallenged superiority in speed to any other European seaplanes, as shown by their run-away victory in the Schneider Cup race, removed the last trace of that suspicion which certainly did exist in Europe as to the accuracy with which American speeds were observed, and forced a general recognition of the really great lead which America had secured in the production of high-speed aircraft.

That the American 260 m.p.h. machines are useless for any other purpose than that of racing may safely be admitted, but their production has had a marked effect on the design of high-speed military machines, very largely because they have opened the eyes of the military authorities of the world in general and of the United States in particular as to the speeds that can actually be attained. It will certainly be some appreciable time before practicable military machines of 260 m.p.h. are produced, and obviously they will always be slower than the pure racing freak, but after having remained nearly stationary there is distinct evidence that the speeds of military machines are now on the increase, and by other processes than by the use of engines of greater power.

Since the end of the War the tendency in producing new military types of aeroplanes has been generally to use the increased knowledge and experience of aircraft design and construction for the production of types carrying greater loads, either in the form of more potent armament or greater fuel capacity, without any actual increase in performance, apparently owing to an assumption that no very great increase in performance was possible. The real value of the racing machine is in its effect in destroying such misleading if comforting assumptions, and in producing incentive to progress along lines which otherwise might be entirely neglected.

Nor is the influence of the recent advance in the speed of racing aircraft likely to be confined to military machines. Although there is not and is not likely for long to be any economical justification for pushing the speed of commercial aeroplanes to a figure very much higher than is even now attained by the most modern of such types, the problem of producing an efficient commercial machine, like that of producing a machine of the maximum possible speed ultimately resolves itself into producing a machine of the minimum possible resistance, and some at least of the methods which serve for the one purpose will be available for others.

The wing radiators, which are a feature of the American racing machine and which account for some considerable proportion of their increased speed, can certainly be applied to commercial aircraft—not to increase their speed, but to allow them to maintain the same speed with the expenditure of less power.

The saving thus possible is by no means negligible, and its results are cumulative, for if the power required is reduced the weight of engine and of fuel which must be carried can be reduced, and the paying load can be increased. When it is remembered that a modern 100 m.p.h. passenger-carrier running on a 250 mile stage may have to carry half as much load in the form of petrol as it can carry in the shape of passengers and cargo, and that engine and fuel together may weigh approximately as much as the total paying load, it will be realized that any saving in the weight of fuel and power plant has an immense effect on the commercial efficiency of the machine.

The second of the outstanding phenomena of 1923 was the remarkable success of the British Light Aeroplane competition held at Lympne in October. As to the inherent utility of the low-powered aeroplanes which took part in that contest, there are varied opinions. That from such machines types can be involved which will have uses for such purposes as the early training of pilots, and for private transport under favourable conditions, there can be no doubt. Personally, one is inclined to believe that there are even now useful fields for some of the existing types, but this is not perhaps the appropriate place for argument on the subject.

What is of importance is that the light aeroplane has opened a new field of aeroplane design—not in the sense that it has called for fundamental changes in the principles of design, but because it has set the designer limits within which to work which are widely different from those to which he has been accustomed. Just as the racing machine and the commercial machine both depend on the reduction of resistance for success, so also does the light aeroplane.

In fact it would be safe to go further and say that this is the main problem which confronts the designer of every aeroplane—for eventually the problem of keeping down resistance includes that of keeping down weight, for weight in the aeroplane would be relatively unimportant if it did not lead to resistance.

The light aeroplanes actually present at Lympne gave results better than even the most optimistic had expected. Faced with the old problem of reducing resistance, but under novel conditions, the designers adopted methods which although they were in no sense revolutionary were yet in advance of standard practice in normal types of aeroplane, with exceedingly—even surprisingly—satisfactory results.

One of the greatest hindrances to rapid progress in the design of more efficient aeroplanes is the lack of a complete knowledge concerning the laws which govern the performance of aircraft. It is not yet possible to predict with certainty the effect on the performance of an aeroplane of even quite small changes in design.

The building of an experimental aeroplane is therefore a distinctly speculative business, and as the normal machine of either military or commercial type is a costly affair, designers reasonably hesitate before departing widely from standard types—for which experience provides reasonably reliable data.

The light aeroplane is relatively cheap and consequently there is considerably less financial risk involved in incorporating novel features in the design. Even in this country, where the number of monoplanes other than light aeroplanes produced since the end of the War can be counted on the fingers, the majority of the light aeroplanes produced were not only monoplanes, but thick-winged monoplanes, and it cannot be doubted that the results obtained with these light aeroplanes has gone some considerable way towards removing from the minds of British aeronautical engineers that deep suspicion of any wing much thicker than the particular section known technically as R.A.F.15 which had been implanted in them by sundry well-meaning research workers.

It may therefore be expected that the most important result of the Lympne Light Aeroplane Competitions will be an increased readiness on the part of British designers to experiment with hitherto heterodox types of wing section, and a somewhat less unanamity on their part as to the invariable superiority of the biplane for practically all types of aeroplane.

The results so far attained do not by any means settle the monoplane versus biplane controversy, but so far as this country is concerned they go some way towards re-opening that controversy after many had, quite erroneously, imagined that it had been settled once and for all. There seems no reason to suppose that either type will ever establish in truth the sort of overwhelming superiority with which the biplane was commonly credited a few years ago.

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METAL CONSTRUCTION.

The use of metal for aircraft construction continues to increase, though it is yet far from having displaced timber for this purpose. In France, in particular, duralumin is used for the majority of new types of military aircraft. The very large scale on which the French Government now orders military machines makes it possible for all-metal machines to be built at relatively reasonable prices.

In other countries development in this direction has been on a more restricted scale, and largely confined to the production in small numbers of experimental types. In Germany a number of designers produce nothing but all-metal aircraft, but only the Junkers firm seems to have any notable production in Germany itself, thanks to the restrictions imposed on German aircraft by the Inter-Allied Commission of Control. Arrangements have, however, been made whereby machines of German design are built in Sweden, Denmark, Switzerland and Italy, and if one includes these among German machines, Germany may be held to be second to France in the development of metal aircraft on a production basis.

In America, both duralumin and steel are being used in experimental quantities, and there can be no doubt that the technique of metal construction is being studied along sound lines, but there, as in England, the production of aircraft on a sufficiently large scale economically to justify metal construction as a general rule is not yet possible.

Outside of England, either duralumin or a similar alloy, sometimes mixed with a small number of steel members, is the most favoured metal for aircraft construction, and the inherent difficulties of the use of steel as the chief structural material have nowhere been attacked on such careful and thorough lines as has been the case in England.

Here it is still true that metal construction continues in the experimental stage, but it has advanced to such a stage of development that only a sufficiently large demand for aeroplanes is necessary to make it possible to produce standard all-metal types which could compete in every way with the more usual timber-framed type.

From the practical point of view, the position of all-metal aeroplanes in Great Britain has been considerably simplified by the recent recognition on the part of the Air Ministry of duralumin as a permissible material for vital members. The long refusal to accept this material has probably had an excellent effect on the technique of British metal construction, and it is pretty certain that duralumin will in the future be used in conjunction with steel in British-built aircraft to considerably greater advantage than would have been the case if the more difficult problems of steel construction had not already been largely solved.

OFFICIALISM AND PROGRESS.

In this case, as in many others, the British Aircraft Industry may perhaps rightly feel that the Air Ministry by its somewhat conservative policy in technical matters has helped to lay a sound foundation for the future. There is no doubt whatever that under the control of the Air Ministry and the very strict enforcement of the Air Navigation Regulations, British commercial aeroplanes have established a reputation for safety and reliability unequalled throughout the world, and that this reputation has some material value in the present and will have a colossal value in the future.

On the other hand, a reputation for safety and reliability may be purchased at too high a price, and there is strong reason to hold that the British authorities have been in some cases considerably too conservative, and have been too successful in their efforts to make all flying in Britain safe. There is very little doubt that they have restricted experimental work by the very stringent requirements which have been laid upon British aircraft designers, not merely in respect of machines which are used for commercial passenger-carrying purposes, but also in machines for military and sporting purposes.

In the case of military aircraft, the attempt to secure safety of the aeroplane has been combined with an effort to equip the aeroplane for every possible contingency, with the result that British military types have during the past few years grown more and more heavily loaded and have, if anything, deteriorated in performance—so that at the present moment the latest British military aeroplanes are markedly inferior in this respect to those of several other powers.

The effect of this singularly short-sighted policy has been exaggerated by a mistaken sense of economy, which insists on the consumption of large stocks of obsolete equipment, relics of the late War, which are used up on new aeroplanes before more modern and efficient equipment can be put into service. That the aeroplanes so equipped suffer seriously as a result is too obvious to need argument.

Complaints of a somewhat similar nature are made in America concerning the Technical Departments of the Military and Naval Air Services, but in that country a rivalry between the two services which does not exist in this country serves to some extent to brighten the edge of official obtuseness.

The competition between the Army and the Navy for the honour of winning the Pulitzer Trophy race seems to have been the reason why American designers were given a free hand in the design of the more recent American racing types, and the results thus obtained have undoubtedly led to the production of useful military machines which would pretty certainly never have been built under the usual process of official technical control.

It is worthy of remark that in this country it was only the fact that the technical staff at the Air Ministry could not in the time available have subjected the light aeroplanes entered for the Lympne Competitions to the usual process of technical examination and inspection which exempted those machines from the official control of their design. There is not a great deal of doubt that had the authorities exercised their full powers in this case, no results worthy of note would have been attained at Lympne.

ENGINES.

In the matter of engines, progress is continuing at a steady and satisfactory rate. An entirely new type of engine requires a much longer period for its manufacture and for its *mise au point* than does a new type of aeroplane, and it is inevitable that progress in engine design from year to year should rarely be marked by epoch-making novelties. The American achievements in the matter of speed records have largely been due to the development in America of extraordinarily efficient and light aero-engines, and the way in which the American racing results have produced in Europe a sudden awakening to the great advances in engine design made in that country have produced in some quarters the idea that American engine builders have made a sudden leap forward.

In truth this is not the case. The engines particularly involved have been in process of development for long years and have long been known for their high qualities to those who have kept in touch with American aeronautical engineering. The American attack on speed records was not made until the engines for the purpose were available, and the suddenness with which the attack succeeded is responsible for the belated recognition of American progress in engine design.

There is reason to believe that certain new American engines now in process of development, which are just entering upon the stage of production, will shortly show themselves to be measurably superior in respect of weight, economy and reliability to any of the now well-known American types.

From the point of view of performance alone, there seems little room for doubt that America now leads in the production of aero-engines. It may still be doubted whether in the combined qualities of reliability, high performance and economy America can yet beat the best of British engines, but it can certainly be said that Britain at the moment does not hold that assured supremacy in engines that was hers two or three years ago. Fortunately there is no cause at the moment for serious concern, for Britain can undoubtedly hold her own in the future, provided that the British engine makers are faced by reasonable orders for improved engines. There is strong reason, as already mentioned, to believe that the British Air Ministry is not properly alive to the importance of performance in aircraft engines, but recent events have at least stirred it slightly.

In regard to research bearing on the development of fundamentally new types of engine, progress is necessarily even slower than in the production of new engines on more or less conventional lines. Work devoted to this end is, of course, of vital importance to the future of aviation, and here Britain is pretty certainly holding her own. The great difficulty in this country in these matters is that although Britain possesses research workers of the greatest ability and of unexampled pertinacity, there is a great lethargy in the matter of making practical use of their work.

It is probable that the recent work of Mr. Ricardo, who has developed a simple and practical method of working with what is known as a stratified charge, will be of the very greatest practical value in the not far off future. One of the most serious defects of the normal petrol engine is due to the fact that a mixture of petrol vapour and air containing any large excess of air over that required for perfect combustion cannot be exploded in the working cylinder. The result is that if an engine is required to develop considerably less than its maximum torque, the mixture strength has to be maintained sensibly constant, and the total weight of mixture (petrol and air combined) must be reduced by throttling. The result is that the thermal efficiency falls and the consumption of fuel per h.p. hour when throttled is appreciably increased.

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If the torque can be reduced entirely by reducing the quantity of petrol per stroke, and making up the deficiency in total gas mass by admitting extra air, the consumption per h.p. hour can actually be reduced at reduced torque. As the average aeroplane uses full engine torque only for getting off and climbing, an engine having these qualities would effect a considerable saving, not only in the cost of fuel, but also in the weight of fuel which must be carried for a given journey. This, in turn, leads to an increase in the useful load which can be carried.

In the engine which works on a stratified charge, a mixture of petrol and air in the best proportions for combustion is introduced into the cylinder in the vicinity of the sparking plug, the remainder of the cylinder volume being filled with petrol-free air. If these conditions can be attained, the rich mixture fires quite irrespective of the average mixture strength of the whole cylinder charge, and the torque can be reduced by changing the ratio of mixture to pure air admitted.

Mr. Ricardo has produced an experimental sleeve valve engine which satisfactorily produces the required conditions, and there is good reason to expect that a practicable aero-engine which shall have a fuel consumption, under cruising conditions, only about 60% of that of ordinary engines will fairly soon be a practical possibility. Such a saving in fuel consumpiton renders possible the increase of the pay load capacity of present commercial aeroplanes by about 20%—which is quite enough to make the difference between a profit and a serious loss in the operation of an air line.

WHY PROGRESS IS SLOW.

It has, however, to be remembered that between success in the experimental stage of a development such as this and the production of a commercial engine which shall reproduce the experimental results, it is necessary to expend a very great amount of money. The result is that the practical engine embodying these new developments can only be sold at a price which would render it commercially a sound investment when the manufacturer is assured of a reasonable sale for that engine.

This is true of many other developments which can fairly safely be predicted in the near future. Taking into consideration the various known methods by which the aeroplane and the aeroplane engine can be improved, there is very little doubt that a commercial aeroplane having the performance of the best machine of the type now in existence, in every way its superior in regard to safety and reliability, and carrying at least 50% and probably 100% more paying load per h.p., could be built within the next twelve months. But that aeroplane would cost so much to construct as a single sample—or even in a batch of four or five—that no traffic at present visible on an existing air line would justify the capital expenditure involved.

As a result there is a sort of deadlock. Those who wish to run air lines are quite clear that their operation can be made successful if the aeroplane constructor will produce sufficiently improved aeroplanes at not too high a first cost. The aeroplane designer has to answer that he cannot give them the required aeroplanes unless they can order machines in considerably larger quantities than the air lines can at present put into service.

This is by no means an unprecedented state of affairs—similar conditions will be found to have existed in the earlier stages of many forms of enterprise, and particularly of transport enterprises. The difficulty is not to be overcome by mutual recrimination between aeroplane manufacturers and aeroplane operators—it has to be solved in other ways.

And the only hopeful method that is at present visible seems to be that of exploiting vigorously every form of service which the present aeroplane—despite its imperfections—can economically undertake. There are many of these. Aerial survey work, the transport of small and urgent goods over routes where normal communications are slow, and quite a number of similar undertakings will bear charges per ton-mile considerably in excess of those necessary to show a profit on aerial transport. By attending to opportunities such as are to be found outside the activities of the normal surface transport undertakings of the world, a market for aeroplanes in quite considerable quantities can be built up and the rapid production of much more efficient aeroplanes will be rendered possible.

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PART A.

THE WORLD'S AERONAUTICAL PROGRESS.

ARRANGED IN

ALPHABETICAL ORDER OF NATIONS.

(BEING HISTORICAL NOTES ON THE YEAR'S WORK OF EACH NATION IN MILITARY, NAVAL AND CIVIL AVIATION, TOGETHER WITH THE NAMES AND ADDRESSES, WHERE OBTAINABLE, OF THE AERONAUTICAL OFFICIALS, DEPARTMENTS, ASSOCIATIONS AND PUBLICATIONS OF THE VARIOUS NATIONS.)

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ARGENTINA.

(Contributed by the Argentine Authorities.)

A Vickers Viking Amphibian (Rolls-Royce engine) belonging to the River Plate Aviation Co. and used on the Buenos Aires—Monte Video Service.

Aerial Society :—
Aero Club Argentino, Pasaje Güemes, Buenos Aires.

Aerial Journals :—
Aviacion, Uruguay 1093, Buenos Aires.
Boletin del Aero Club Argentino, published monthly, Avenida de Mayo, 646, Buenos Aires. The official organ of the Argentine Aero Club.

ARGENTINE ARMY AVIATION.

The Argentine Army has a small but well-equipped Flying Corps, which has been chiefly trained by French aviators. Its machines were formerly all French, but of late Italian S.V.As have been largely adopted for the fighting squadrons and Bristols (bought from the Aircraft Disposal Co., Ltd.) for the reconnaissance and bombing squadrons.

ARGENTINE NAVAL AVIATION.

Since the beginning of 1920, the Ministry of Marine intended to implant Aviation as a new branch of the Navy, creating the Naval Aviation Division and obtaining a sum of 1,500,000 pesos earmarked in that year's budget for the creation of a school for Pilots and Aviation Mechanics, and this school was established at Puerto Militar in 1921.

The School of Naval Aviation is a very fully-equipped affair and consists of three wood and reinforced-concrete hangars of 800, 920 and 1,800 cubic metres, and workshops, carpenters' shops and mechanics' quarters. In addition to slipways to the sea, an aerodrome, 850 m. × 550 m., adjoins the school.

The personnel of the school consists of 24 officers, instructors, etc., and 300 men, who are quartered on the training ship "Almirante Brown," which is moored near the school.

The school is commanded by Capitan de Fragata J. Gregores.

The machines used at the school are Avro "Viper" seaplanes (180 h.p. Wolseley "Viper"), H.S. flying-boats (400 h.p. Liberty), and F.5.L. flying-boats (2—400 h.p. Liberty).

A naval lighter-than-air school was opened in 1922 at Puerto Barragán.

ARGENTINE CIVIL AVIATION.

Civil Aviation Firms :—

Sociedad Anglo Argentino de Aviacion. Offices : Buenos Aires. Directors : James Fraser Bremner, Eduardo Miguel Hearne. Services operated : Short Flights. Flying School. Machines used : Avro.

River Plate Aviation Company (Compania Rioplatense de Aviacion). Offices : Buenos Aires. Director : Major Shirley Kingsley. Services operated : Buenos Aires—Monte Video. Machines used : De Havilland (Rolls-Royce), Bristol, Potez, Dornier.

It has also acquired some Vickers "Viking" amphibian flying-boats (Rolls-Royce engines) with which to run a mail line from the City of Buenos Aires to the City of Monte Video. The chief pilot is Major Brian Ferrand, D.S.O. (late R.N.A.S.).

On the left:—Officer Pilots of the Argentine Army Air Service.

On the right:—Officers of the Argentine Naval Air Service.

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AUSTRIA.

The Empire of Austria-Hungary having been broken up into various "self-determined" sections, there is now no Air Service, and very little Aircraft Industry to be described.

The following has been received from an Austrian friend :—

Aerial Societies :—

Oesterreichischer Aeroklub, Vienna, I, Kaerntnerring 10 (Member of the Fédération Aéronautique Internationale).

Oesterreichischer Flugtechnischer Verein, Vienna, I, Friedrichstrasse, 3.

(Both these Associations have amalgamated under the Aeronautischen Verband, so as to promote aviation in Austria in a common endeavour.)

Oberoesterreichischer Verein fuer Luftschifffahrt, Linz.

Verein fuer Luftschifffahrt, Steiermark, Graz.

The following associations have undertaken the task of fostering the development of motorless flying :—

The Aviators' Section of the Oesterreichischer Aeroklub.

Segelflugvereinigung of the Technical High School of Vienna.

Segelflugabteilung of the Verein fuer Luftfahrschifffahrt in Steiermark.

Aerial Journals :—

Flugzeug und Jacht. Official organ of the Aeronauticher Verband, Vienna, I, Friedrichstrasse, 3.

Oesterreichischer Motor der Flug, Vienna, VIII, Josefstaedterstrasse 87.

Aerodromes :—The three aerodromes at present under the control of the Austrian Government, Aspern, near Vienna, Thalerhof, near Graz, and Annabichl, near Klagenfurt, are in working order.

Aspern Aerodrome is the Custom House aerodrome and is situated 8 kms. to the East of the centre of the city of Vienna, on the electric tramway ; it possesses a railway siding for forwarding aircraft. The area of the grounds suitable for taking-off and landing is 600 × 800 m.

Thalerhof Aerodrome. At about 9 kms. to the south of the centre of the city of Graz, 1¼ kms. S.W. of the Abtissendorf railway stopping place. The available area for flying-off and landing is 500 × 1,000 m.

Annabichl Aerodrome. About 3 kms. north of the centre of Klagenfurt, stopping place of the electric tramway, passenger station of the Austrian Federal Railways. Rails and platform for the forwarding of aircraft. Area available for taking-off, 500 × 550 m. (the south-easterly side of the aerodrome—one-third of it—is at present the best part).

Private Aerodrome of the Austrian Air Navigation Companies for Sea and Land Aircraft, close to Jedleses on the Danube, near Vienna. About 5 kms. north of the centre of the city of Vienna and can be reached from the Nussdorf Railway Station and the stopping place of the electric tramway over the Danube.

Aviation Companies :—

Oesterreichische Luftverkehrs-Aktiengesellschaft, Vienna, IV, Karlsplatz, 7.

Technische Werkstaetten Gesellschaft m.b.H., Vienna, I, Freyung 3.

"Austria" Flugverkehrs-Aktiengesellschaft, Vienna, IV, Mariahilferstrasse, 109.

Air Lines :—

During the year 1923, The Compagnie Franco-Roumaine de Navigation Aérienne, who had already in the previous year inaugurated the international line Paris—Prague—Vienna—Budapest—Belgrade—Bukarest—Constantinople, maintained this service during 1923 also.

The Oesterreichische Luftverkehrs-Aktien-Gesellschaft (by using its newly constructed aerodrome on the Danube) opened, on May 14th, a service between Vienna and Munich with Junkers aeroplanes, in conjunction with the lines Munich—Geneva and Munich—Berlin. This same company using its marine aero-port on the Danube, started on the 16th July a similarly active service with Junkers seaplanes between Vienna and Budapest.

On July 30th, the Hungarian Luftverkehrs-Aktingesellschaft inaugurated also an air line between Vienna and Budapest, using the Aspern Aerodrome, with Fokker machines.

In the course of this traffic from and to Vienna, which was carried on without any accident either to passengers or to the pilots, up to the end of October, 1923, 2,361 persons and 46,720 kilos of goods were carried in 1,538 flights, covering altogether 365,400 km., of which 140,390 km. over Austrian territory.

In addition ot this regular service, a number of joy-flights were carried out by various concerns over Vienna and the suburbs, as well as exhibition flights in several towns.

AIRCRAFT.

The construction of aircraft in Austria was limited by the terms of the Treaty of St. Germain, and Austria was bound to observe the regulations laid down by the Entente Powers regarding civilian and military aviation. This, of necessity, set a strict limit to the performances of the machines.

In 1923, only a small number of touring and commercial aeroplanes of no great dimensions were produced in Austria. Steps have, however, been taken to start the building of transport aircraft next year on well defined lines.

The Technical High School of Vienna, 8, Karlsplatz, 13, includes a lecturing hall for aviation matters with an aero-mechanical laboratory and is entrusted to Prof. Ing. Richard Knoller.

GLIDING.

The first Austrian gliding week was held on the Waschberg, near Stockerau (394 m. above the sea and 170 m. above the plain close to the hill), in the neighbourhood of Vienna, in which airmen from Germany and Austria participated, with the following results :—Height above the starting point, 270 m. ; greatest distance flown, 10 km. ; longest flight, 47 minutes.

AERONAUTICAL STATE ORGANISATION.

The official agenda of aeronautics is provided in Austria by the Federal Ministry for Trade and Communications, Vienna, I, Stubenring 1, which in its Department 49 possesses a special office for aircraft.

The consultative organism of the Federal Ministry for Trade and Communications is the Oesterreichischer Luftfahrtausschuss, which is composed of experts in the different branches of aviation.

BELGIUM.

Aerial Society :—

L'Aero Club de Belgique. Founded 1901. Offices : 73, Avenue Louise, Brussels. Affiliated with the Federation Aéronautique Internationale.

Aerial Journal :—

La Conquête de l'Air. Founded 1912. Published twice monthly, 16, Rue Thérésienne, Brussels.

(The following matter is published by courtesy of the Belgian Air Attaché in London, the Chevalier Willy Coppens, D.S.O., M.C.)

Military Aerodromes :—

Evère (Brussels).
Schaffen (Diest).
Gossoucourt (Tirlemont).
Asch (Hasselt).
Bierset (Liége).
Nivelles. (In preparation.)
Brasschaet (Camp de Brasschaet). Auxiliary without permanent personnel.
Beverloo (Camp de Beverloo). Auxiliary without permanent personnel.
Elsenborn (Camp d'Elsenborn). Auxiliary without permanent personnel.
Wevelghem (Courtrai. In preparation.

Civil Aerodromes :—

Aérodrome de **Bruxelles** (Haren-Evère) :—Civil Aerodrome, with Customs, Wireless, Sheds, Telephones, Lighthouse, Meteorological Stations.

Aérodrome d'**Ostende** (prés de Steene) :—Civil Aerodrome, with Customs, Wireless, Sheds, Telephones, Lighthouse, Meteorological Stations.

Station d'Hydravions d'**Ostende** (Bassin de chasse) :—(In preparation.) Civil and Service Station, with Sheds and slipway.

Aérodrome de **Deurne** (Anvers) :—Fully equipped Civil Flying School.

Aérodrome de **Malchamp** (prés de Spa) :—Civil Station, with Shed and Telephone.

Aérodrome de **Gosselies** (prés de Charleroi) :—Private Civil Station (School), with Shed and Telephone.

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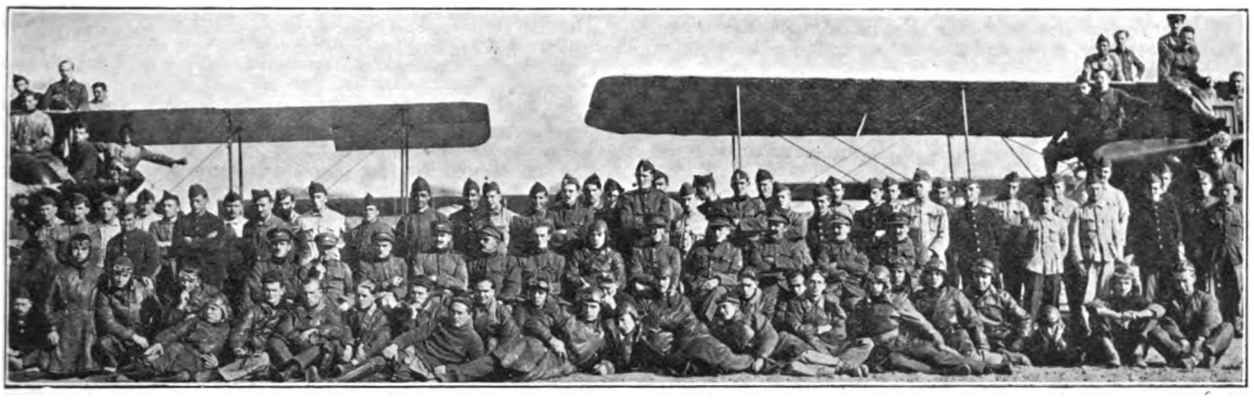
BELGIUM—*Continued.*



A Group of Instructors and Pupils of the Belgian Royal Flying Corps at the Military School at Asch. The machines in the background are a Breguet 14A2 and an Avro 504K.

MILITARY AERONAUTICS.

Director of Aeronautics:—Col. A. E. M. Van Crombrugge, C.B., C.M.G., 75, Rue du Commerce, Brussels. Tel. 33867.

Commandant of Aeronautics:—Major Smeyers.

L'Aéronautique Militaire, commanded by Major Smeyers, comprises 29 escadrilles (squadrons), of which 4 are balloons and airships, 6 are divisional aircraft, 3 reconnaissance, 3 pursuit, 3 bombardment, 3 school and 3 technical.

The machines in use are Nieuport Delage 29 and Spad XIII (300 h.p. Hispano-Suiza), D.H.4 (360 h.p. Rolls-Royce), D.H.9 (240 h.p. Siddeley "Puma"), Bristol Fighter (300 h.p. Hispano-Suiza), Ansaldo A.300/4 (300 h.p. Fiat), with a number of Avros for training.

The following additional information has been received from an unofficial source:—

Under the date April 1st, 1923, the Commandant of Belgian Military Aeronautics issued orders for the peace-time organisation of the Belgian Royal Flying Corps, this organisation came into force on August 1st, 1923, as follows:—

H.Q. Military Aeronautics:—3, Avenue Jean Linden, Brussels. Tel. 30161.

1st Group. Zellick. 4 squadrons of 1 Kite-balloon each.

2nd Group. Gossoucourt. 6 squadrons (observation) of 10 machines each. (Ansaldo, 300 h.p. Fiat, or D.H.9, 240 h.p. Siddeley).

3rd Group. Evère. 4 squadrons (army co-operation) of 12 machines each. (Bristol, 300 h.p. Hispano-Suiza.)

4th Group. Schaffen. 3 squadrons (combat) of 15 machines each. (Spad XIII or Nieuport Delage 29, both 300 h.p. Hispano-Suiza.)

5th Group. Nivelles. 2 squadrons (combat)—idem.

6th Group. Bierset. 3 squadrons of 8 machines. (D.H.4, 360 h.p. Rolls-Royce and D.H.9, 240 h.p. Siddeley "Puma.")

7th Group. Evère. 3 technical squadrons and 1 stock squadron.

8th Group. Asch. Flying School divided into 3 squadrons.

The Royal Flying Corps comprises about 120 pilots, of which 50 are officers and 70 non-commissioned officers, and 30 observers.

CIVIL AVIATION.

Civil Aviation is under the Administration de l'Aeronautique, directed by Colonel A. E. M. Van Crombrugge, and depends provisionally on the Ministère de la Defense Nationale.

It has charge of aerodromes, surveillance of air traffic, partition of subsidies and air law leased on the Convention Aérienne Internationale of 1919.

The Aero Club of Belgium has conducted a number of highly successful competitions during 1922.

Air Companies:—

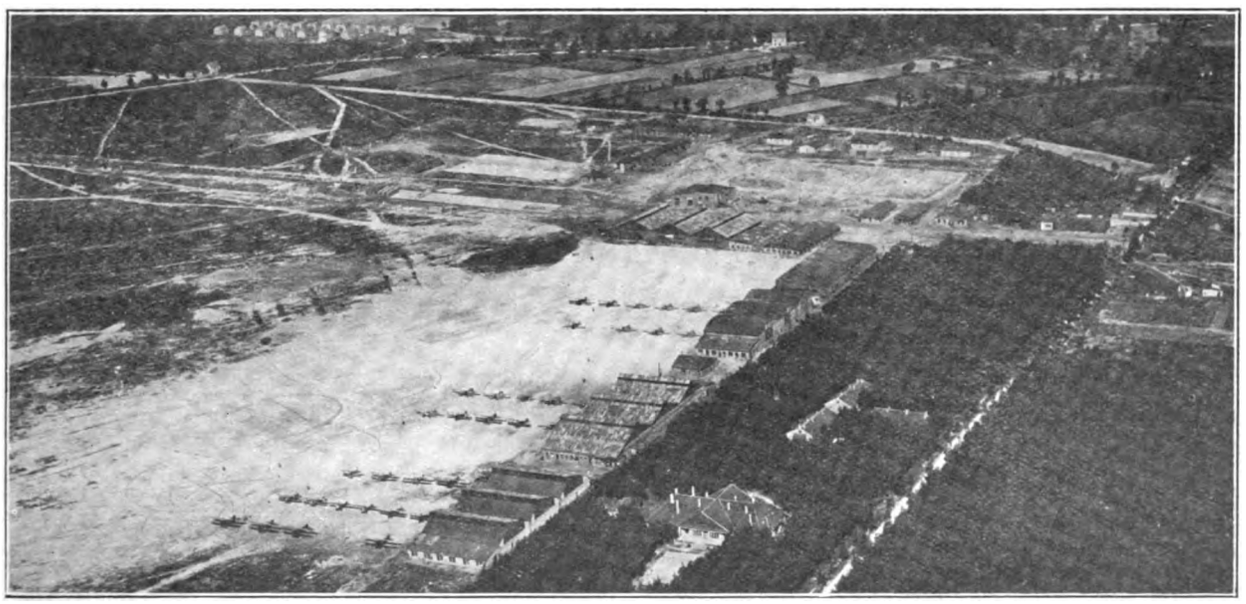
Société Anonyme Belge D'Exploitation de la Navigation Aérienne (S.A.B.E.N.A.). Date of Incorp.: 1922. Offices: Boulevard Adolphe Max 32, Brussels. Services operated: Rotterdam—Antwerp—Brussels—Strasbourg—Bâle—Kinshasa—Stanleyville (Belgian Congo).

This company has acquired the operating business of S.N.E.T.A., of which it is an offshoot.

Compagnie Aérienne Belge (C.A.B.). President: M. Fernand Jacobs, President of the Aéro Club de Belge. Organises aerial photography and aerial survey work in Belgium and the Belgian Congo.

Société Anonyme Belge de Constructions Aeronautiques (S.A.B.C.A.). (Capital: 5,000,000 francs.) Factory near the Aerodrome de Bruxelles, Haren. Constructs and repairs aircraft, aero-engines, balloons, kite-balloons, etc.

Société Colombophile de Transports Aériens (S.O.C.T.A.). (Capital: 1,000,000 francs.) President: M. Jules Jaussens, President of the Fédération des Sociétés Colombophiles. To transport racing pigeons to localities in France or neighbouring countries in connection with pigeon racing.



The Military School at Asch. The officers' quarters can be seen in the foreground, behind the sheds.

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BELGIUM—*continued.*

Build under license: De Havilland, Handley-Page, Nieuport Delage, Avro and Ansaldo aircraft for the Belgian Government.

Three engineers of the S.A.B.C.A., MM. Jullien, Poncelet and Cambier, have produced three light aeroplanes.

The S.A.B.C.A. have a yearly minimum contract with the Belgian Government of 6,000,000 francs, and during 1922 produced 43 complete aeroplanes, repaired 36 aeroplanes and 204 aero-engines and constructed 2 spherical balloons. During 1923 they built 30 Nieuport Delage type 29 single-seater scouts, 15 Ansaldo type A.300 two-seater reconnaissance machines and 24 Avro 504K training machines in excess of the annual contract. The works at Brussels covers an area of 18,000 sq. m. and employ a staff of 89 managers, technicians and designers, 13 foremen and 403 workers.

Other small constructing concerns are :—

J. Stampe and M. Vertongen, Deurne-Sud, Antwerp. Building two types of training machines, one fitted with the 90 h.p. Anzani engine and the other with the 180 h.p. Hispano-Suiza engine, both of which have passed official tests imposed by the Belgian Government.

The Gosselies Aviation School, Charleroi. Under Commandant Rosschaert, are constructing a semi-cantilever two-seater monoplane for the 45 h.p. or 70 h.p. Anzani engine.

The Zeebrugge Aero Works, Zeebrugge. Organised by Commandant Jacquet. Are building an all-metal two-seater side-by-side monoplane for a 70/80 h.p. engine.

The Military School at Asch have also constructed a light aeroplane which has flown successfully.

Entreprises Générales d'Aéronautiques, Gosselies. Runs a school where "Centaur" aeroplanes (Central Aircraft Co., London) are used.

Laboratory :—

The engineer Allard, professor of the University of Brussels, controls Le Laboratoire Aérodynamique de Belgique. A wind-tunnel has been installed and a bulletin is published.

It is to be specially noted that their Majesties the King and Queen of Belgium have taken the keenest interest in flying. Both flew frequently during the War. King Albert was presented with the British "Distinguished Flying Cross." Since the War, the King and Queen have flown a great deal, and recently Queen Elizabeth was presented with a Bristol biplane for her own use by the Aircraft Disposal Co., Ltd.

BOLIVIA.

Air Company :—

La Sociedad Boliviana De Transportes Aeros. Date of Incorp.: July, 1921. Offices: Cochabamba. The company has obtained Government permission to operate an Air Line between Cochabamba and Santa Cruz.

MILITARY AVIATION.

A start in this direction was made in 1917, when Capts. Jose Alarcon and Renato Parejas, and Sub-Lieut. Horacio Vasquez were sent to El Palomar (Buenos Aires) for training as aviators.

The Bolivian Government more recently bought two aeroplanes from the U.S.A., which succeeded in flying all over the country, in consequence of which Bolivia has now installed a School of Aviation in La Paz.

The actual economic conditions of the country do not allow much, but is it hoped in the near future to install an Aviation School in Bolivia.

BRAZIL.

Aerial Society :—

Aero Club Brasileiro. Founded: 1911. Offices: Avenida Rio Branco, Rio de Janeiro. President: Senator Sampaio Correa. Vice-President: Dr. Amilcar Marchesini. Affiliated with the Fédération Aéronautique Internationale.

Aerial Journal :—

Aerophilo. The official organ of the Aero Club of Brazil.

CIVIL AVIATION.

Very little progress has been made during 1922 in civilian flying.

There are at the present moment three civilian schools, one of Mr. Edu Chaves, another of two Italian brothers named Robert, and the third of Mr. Orton Hoover, of the Curtiss Co.

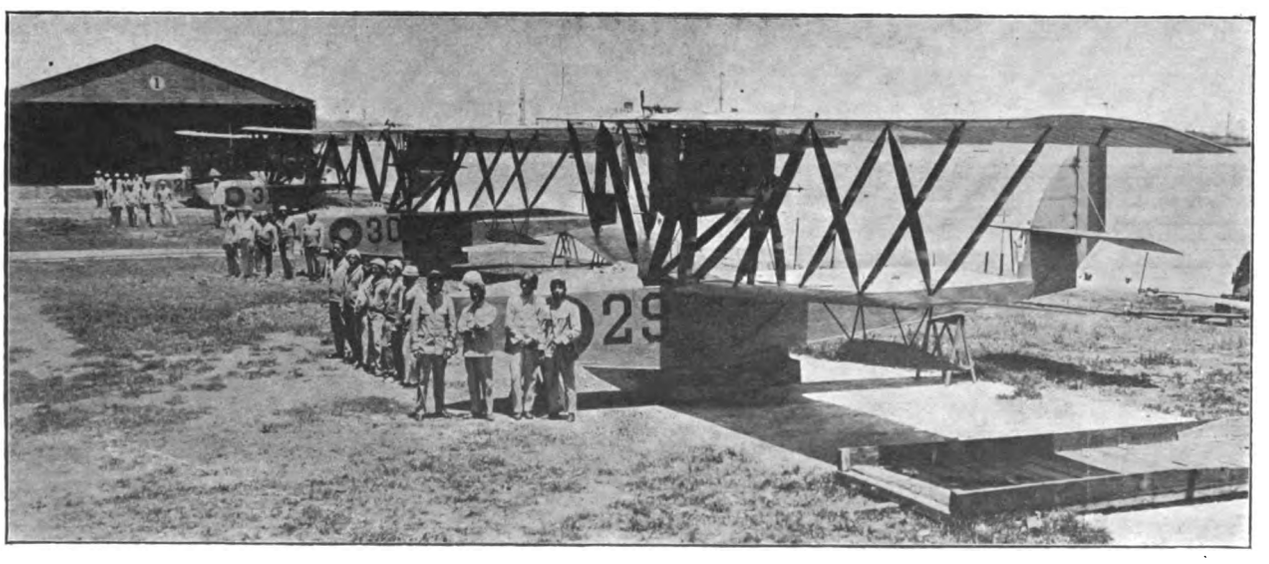
The agreement of the Government with Handley-Page, Ltd., has not materialised.

Messrs. Lage Irmaos, of Rio, have turned out a few machines of a design produced by Capt. Lafay, of the French Mission.

NAVAL AVIATION.

For the following Naval information one is indebted to Lieut.-Comm. M. A. Pereira de Vasconcellos, B.N., Air Attaché to the Brazilian Embassy in London.

A scheme for General Organisation of the Navy's Air Service, establishing an Air Policy for the next few years, has been for some time under consideration, and definitely approved and put into force in 1922.



Brazilian Naval Aviators with their flying-boats at the Ilha do Governador.

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BRAZIL—*continued.*

In consequence, a First Class Air Station is being built at Ilha do Governador (Rio de Janeiro Bay) and another of Second Class at Santos, 280 miles south of Rio.

A General Directorate of Aviation concentrating everything connected with Naval Air Service, has been created, and Capitão P. P. Guimarães has been appointed director of same.

The Air Station at Ilha do Governador is composed of a Training, Flying and Co-operation School, N.C.O's. and men's School (Commanding Officer: Capt. de Fragata A. J. Cardoso and Second in Command-Capitão de Corveta Dario P. L. de Castro) and 3 Squadrons, composed of 3 Flights each and 6 machines per Flight. These units consist of both sea and land machines.

The approximate number of personnel is, for the present year, 50 officers and 300 N.C.O's. and men, and will be annually increased as the scheme follows its development, by the construction of new Stations along the coast.

To overcome the difficulties concerned with lack of technical personnel, the Government has sent to England, France, Italy and U.S.A., a selected number of officers who are to be specialised either on technical subjects or organisation of Air Services.

Orders have been placed in England, Italy and U.S. for new machines. These are to be employed in training new pilots (Avros) under the Gosport System adopted in 1921, and for co-operation with the Navy as Scouts (Snipes) and patrol and bombing (F.5's).

The number of machines (old and new) is approximately 100.

Commanding Officer: Capitão de Fragata Antonio Caraciolo, B.N.

2nd in Command, Naval Aviation: Capitão de Fragata Dario Paes Leme, B.N.

Officer in Charge of Works, Naval Aviation: Lieut. Victor de Carvalho e Silva.

ARMY AVIATION.

The Military aviation is in the hands of a French Mission, and the whole concern is monopolised by them. Their training is not of the best and the type of machines used are obsolete, with the exception of the Bréguet.

Their pilots are of an excellent type, but they show faults, in spite of their very good qualities, all due to the bad system of instruction. Recently they have used the non-commissioned type of pilot in preference to officers, most probably due to the fact that the French can have better control over them. The Military aviation is formed by a company attached to the Engineers. They propose to have two bases down South.

THE SITUATION OF AVIATION.

The following survey of aviation in Brazil has been issued by the British Air Ministry :—

The Military Air Force is directed by a French Military Mission which carries out the instruction of pilots and gives technical advice. This Mission arrived in Brazil about the end of 1918 with a renewable two-year contract.

The Military Flying School has 90 machines of the following types :—Nieuport, Breguet 14.A.2, Spad, Sopwith. The school also possesses six Breguets, type 14.A.2 and two Caudrons, type G.4, for geographical work.

One squadron (Breguet 14.A.2) has been formed on the Uruguayan-Argentine frontier at Alegrete and one aircraft park at Santa-Maria, with Breguet and Spad squadrons. The stations at Alegrete and Santa-Maria are commanded by Brazilian officers and the head mechanics are French.

The Naval Aviation School is situated in the middle of the Bay of Rio; it possesses 30 Italian or American seaplanes.

Since the engagement of an Americal Naval Mission, the Government is preparing to order American seaplanes and land planes to the value of five million francs.

The Navy has just bought 12 American F.5 (Liberty 400 h.p.) twin-engined seaplanes, 12 School Curtiss (100 h.p.) seaplanes, 14 Savoia (S.P.A. 300 h.p.) seaplanes for reconnaissance work, and 12 Avros (120 h.p. Le Rhône) for the land school.

The predominant idea of the Brazilian Government is to arm itself at sea and to prepare its coastal defence.

The Navy also possesses an aircraft park at "l'Ilha de Governador," with 20 Italian and 10 English machines.

The St. Paul police are under the instruction of a French Mission, having at its head General Nerel and possessing seven or eight pilots, not at present provided with aeroplanes.

Civil aviation is practically non-existent in Brazil, the Brazilian Government not having yet decided to subsidise air companies.

At Rio de Janeiro, M. Gentil, a Brazilian pilot, owns about ten sea-planes and aeroplanes, purchased from Italian stocks. An American company, with three Curtiss seaplanes, undertakes passenger flights on the Bay of Rio de Janeiro. At St. Paul, M. Edu Chaves, a Brazilian pilot, possesses some seven to eight seaplanes bought from French stocks (Caudron and Moranes).

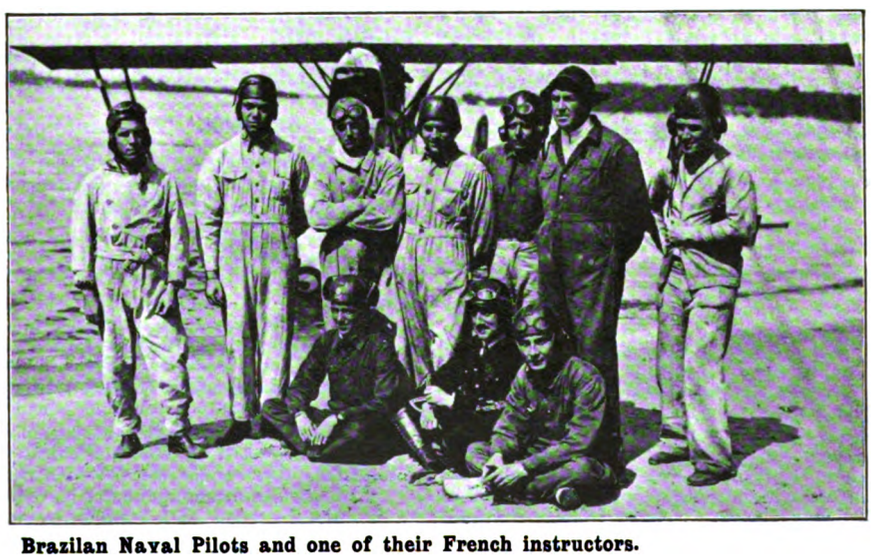
Finally, two German pilots make flights on an old Rumpler in the hope of obtaining passengers or possible pupils.

The first Brazilian aircraft have been constructed and tested by Captain Lafay, of the French Aviation Mission, in Brazil. The first aeroplane, christened "Rio de Janeiro," has been flying for nearly three years. The second aeroplane, christened "Independence," is fitted with a Clerget engine and flew with five passengers in November, 1922, on the occasion of the centenary of the Brazilian independence.

A report from the Brazilian Press, received through the Department of Overseas Trade, states that official tests of a Junkers seaplane were made on June 15th, 1923, in the Bay of Rio de Janeiro. The manufacturers' representative in Brazil, Adolf Petersen, proposes to establish a passenger service with these machines between Rio de Janeiro and Porto Alegre, via Santos and Curitiba. The Minister of Public Works, the President of the Aero-Club, and others were present at the trials. The pilot was Captain Max Drenvsky and the mechanic Franz Schoenmerch. The machine was one of the standard six-seater type with 180 h.p. motor.

Shortly after this event, on June 25th, a Junkers seaplane engaged on a flight from Cuba to Buenos Aires, arrived at Aracaty, near Fortaleza, Ceara, Brazil, and when proceeding to leave that place, was destroyed as the result of an explosion, the occupants of the machine being killed.

A new aviation company has been formed at Rio de Janeiro, called the Cia. Nacional de Navegacion Aerea. The company's object is to establish air lines between various towns in Brazil and between Brazil and other countries. The capital is 200 contos of reis, divided into 1,000 shares of 200,000 reis each, of which 10% has immediately been put on deposit, in accordance with Brazilian law.



Brazilan Naval Pilots and one of their French instructors.

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THE BRITISH EMPIRE.

GREAT BRITIAN.

Aerial Societies :—

The Air League of the British Empire. Date of Incorp. : 1909. Offices : 26, George Street, Hanover Square, London. President : His Grace the Duke of Sutherland. Vice-Presidents : The Rt. Hon. Viscount Cowdray, The Rt. Hon. Lord Montagu of Beaulieu, The Rt. Hon. The Lord Weir of Eastwood, Sir John C. E. Shelley Rolls, Bart., Sir Charles Bright, Sir W. Joynson Hicks, Bart., Maj.-Gen. The Rt. Hon. J. E. B. Seely. Secretary : Douglas G. H. Gordon.

The Institution of Aeronautical Engineers. Offices : 60, Chancery Lane, London, W.C.2. President : Lt.-Col. J. T. C. Moore-Brabazon. Vice-President : Sir Charles Bright. Secretary : L. Howard-Flanders.

A Society for the encouragement, development, and protection of the Profession of Aeronautical Engineering.

The Royal Aero Club of the United Kingdom. Founded : 1909. Offices : 3, Clifford Street, London, W.1. Secretary: Lieut.-Com. Harold E. Perrin.

The Club was formed for the association of persons interested in the encouragement and development of the study of aeronautics in all its branches, and for that purpose to provide a centre of information and advice on matters pertaining to aeronautics, to undertake the control of all competitions, sporting events, and trials in connection with aeronautics in the United Kingdom, and generally to do all such acts and things as may be conducive to the encouragement and development of aeronautics.

Affiliated with the Federation Aéronautique Internationale.

The Royal Aeronautical Society. Founded : 1866. Offices : 7, Albemarle Street, London, W.1. President : Lord Weir of Eastwood. Vice-President : Major-General Sir R. M. Ruck, K.B.E., C.B., C.M.G. Chairman : Lieut.-Col. A. Ogilvie, C.B.E., F.R.Ae.S. Vice-Chairman : Professor Leonard Bairstow, C.B.E., F.R.S. Hon. Treasurer : A. E. Turner. Secretary : Lieut.-Col. W. Lockwood Marsh. Glasgow Branch : Secretary, J. B. Buyers Black.

The Society is the oldest institution in the world devoted to flying. It exists for the furtherance of the Science of Aeronautics, and its activities fall into the following headings :—(1) Protecting the interests of the aeronautical profession by conferring a technical status on those qualified for such distinction. It acts as the professional society or institution of qualified aeronautical engineers. (2) Organising discussions and publishing papers on subjects of importance in connection with the various branches of aeronautical science. (3) Encouraging and assisting technical students who desire to adopt the aeronautical profession for their careers. (4) Providing an organisation wherein those interested in aeronautics from scientific or other motives, but who are not professionally connected with aviation, may meet together, have opportunities of study, and keep themselves in touch with aeronautical affairs.

The Royal Air Force Club. Founded : 1918. Offices : 128, Piccadilly, London, W.1.

This Club exists for the association of officers of the R.A.F., and its ordinary membership is confined exclusively to such officers. It was formed originally as the Royal Flying Corps Club.

The Society of British Aircraft Constructors, Ltd. Incorp. : 1916. Offices : 1, Albemarle Street, Piccadilly, London, W.1. Chairman : C. R. Fairey. Vice-Chairman : Capt. Hubert E. P. D. Acland. Hon. Treasurer : Sq.-Commander James Bird. Secretary : Charles V. Allen.

The Society is officially recognised as the representative body of the British Aircraft Industry. It acts by agreement in co-operation with the Royal Aeronautical Society and the Royal Aero Club in all matters of common interest.

Aerial Publications, etc. :—

The Aeroplane. Founded 1911. Published weekly, price 6d., by The Aeroplane and General Publishing Company, Ltd., 175, Piccadilly, London, W.1. Editor : C. G. Grey. Technical Editor : Capt. W. H. Sayers, F. Inst. Ae. E.

(The recognised organ of The Royal Air Force and of The British Aircraft Industry.)

All the World's Aircraft. Founded by the late Fred T. Jane. Published annually, price £2 - 2 - 0 ; by Sampson Low, Marston & Company, Ltd., 100, Southwark Street, London, S.E.1. Editor : C. G. Grey.

(Work of reference illustrating and giving full details and specifications of all aircraft and engines, with records of progress of aviation in all countries.)

The Air League Bulletin. Founded 1919. Published monthly, price 3d., by The Air League of the British Empire, 26, George Street, Hanover Square, London, W.1. Editor : Douglas G. H. Gordon.

(The official organ of The Air League of the British Empire.)

Flight. Founded 1909 (First Aero Weekly in the World). Published weekly, price 6d., by St. Martin's Publishing Company, Ltd., 36, Great Queen Street, London, W.C.2. Editor : Stanley Spooner.

(The official organ of The Royal Aero Club.)

The *Journal of the Royal Aeronautical Society.* Founded 1897 as the Aeronautical Journal. Published monthly, price 2/6, by The Royal Aeronautical Society, 7, Albemarle Street, London, W.1. Editor : J. Laurence Pritchard.

(The official organ of the Royal Aeronautical Society.)

AERODROMES IN GREAT BRITAIN AND IRELAND.

The following list comprises Aerodromes, Seaplane Stations and Landing Grounds, open to Civil Aviation in Great Britain and Ireland, and Service and Civil Stations, available to Civil Aircraft in case of emergency only.

The Permanent Service Stations and Stations temporarily retained for Service purposes, except aerodromes which are within a prohibited area (for example, Gosport) may be used, in addition to cases of real emergency, for the following purposes :—

(1.) For refuelling in the course of journeys where no civil facilities exist.

(2.) For landing of passengers proceeding to a destination near the aerodrome concerned.

No guarantee is given that any R.A.F. transport will be available, or that the machine can be housed in these cases. Where possible, notice of intention to use any such aerodrome should be given in advance to the Officer Commanding.

The only aerodromes at which Customs facilities exist at present are Croydon, Lympne and Manchester (Alexandra Park) for aerodromes ; and Southampton (portion of River Itchen and Southampton Water) for seaplanes.

Where it is stated that accommodation does not exist, no facilities other than actual landing grounds are available.

No guarantee is given at the present time that personnel to handle aircraft is available either at the Service Stations or at the Civil licensed aerodromes.

ALDERGROVE. Temporarily retained as a service aerodrome. Available for civil machines in emergency only. 4 miles from Antrim and 13 miles from Belfast. Nearest railway station, Aldergrove (G.N.R. of Ireland), 1 mile.

ANDOVER. Permanent service aerodrome, 1½ miles from Andover, available for civil machines in emergency only. Nearest railway station, Andover Junction (S.R.), 1¼ miles.

BEDFORD. Airship station temporarily retained for service purposes, and available for civil machines in emergency only. No facilities exist for dealing with civil aircraft. Nearest town and railway station, Bedford (L.M.S.R.), 3 miles.

BIGGIN HILL. Permanent service aerodrome available for civil machines in emergency only, 6 miles from Bromley. Nearest railway stations, North and South Bromley (S.R.), 7 miles.

BIRCHAM NEWTON. Permanent service aerodrome, available for civil machines in emergency only. The nearest towns are Hunstanton (9 miles) and Kings Lynn (16 miles). Nearest railway station, Docking (L.N.E.R.), 3 miles.

BROOKLANDS. Civil aerodrome licensed for all types of machines, 2 miles from Weybridge and 19 miles from London (Charing Cross). Nearest railway station, Weybridge (S.R.), 1 mile.

BROUGH. Civil aerodrome licensed for all but the largest types of machines, 10 miles from Hull. Nearest railway station, Brough (L.N.E.R.), ¼ mile. There is also at Brough an unlicensed private seaplane station, owned by the Blackburn Aeroplane and Motor Co., Ltd. ; this is available for civil machines only by special permission of the owners, or in emergency. Training aerodrome for R.A.F. Reserve Officers, operated by the Blackburn Co.

CALSHOT. Permanent service seaplane station, available for civil machines in emergency only, distant from Southampton 15 miles by road and 7 miles by water. Nearest railway station, Brockenhurst (S.R.), 12 miles.

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BRITISH EMPIRE.—*continued.*

The R.A.F. Group Headquarters at Andover, including the R.A.F. Staff College. All housed in Army huts.

CASTLE BROMWICH. Civil aerodrome licensed for all types of machines, 5½ miles from Birmingham. Castle Bromwich railway station (L.M.S.R.) is the southwest corner of the aerodrome.

CATTEWATER. Permanent service seaplane station, available for civil machines in emergency only, 6 miles by road from Plymouth and ½ mile by water. Nearest railway station, Turnchapel (S.R.), ¾ mile.

CRANWELL. Permanent service aerodrome, available for civil machines in emergency only, 4 miles from Sleaford, 10 miles from Grantham and 14 miles from Lincoln. Nearest railway station, Sleaford (L.N.E.R.), 4 miles.

CRICKLEWOOD. Civil aerodrome licensed for all types of machines, 6 miles by road to the north-west of London (Charing Cross). Nearest railway station, Cricklewood (L.M.S.R.), ¼ mile.

CROYDON. See Waddon.

DALMUIR. Unlicensed private seaplane station, available for civil machines only by special permission of the owner, Wm. Beardmore & Co., Ltd., or in emergency. Glasgow, the nearest town, is 9 miles from the aerodrome, and the nearest station is Dalmuir (L.N.E.R.), 1 mile. Training aerodrome for R.A.F. Reserve Officers, operated by the Beardmore Co.

DIGBY. Permanent service aerodrome, available for civil machines in emergency only. The nearest railway stations are Scopwick (L.N.E.R.), 4 miles, and Navenby (L.N.E.R.), 6 miles. Sleaford is 8 miles distant, Lincoln 9½ miles.

DONIBRISTLE. Permanent service aerodrome, available for civil machines in emergency only, 5 miles from Dunfermline. Nearest railway station, Inverkeithing (L.N.E.R.), 2 miles.

DUXFORD. Permanent service aerodrome, available for civil machines in emergency only, 8 miles from Cambridge and 7 miles from Royston. Nearest railway station, Whittlesford (L.N.E.R.), 2½ miles.

EASTCHURCH. Permanent service aerodrome, available for civil machines in emergency only, 6½ miles from Sheerness. The aerodrome is connected with the nearest railway station, Queensborough (S.R.), 5 miles distant, by the Sheppey Light Railway.

EDGWARE. See Stag Lane.

FARNBOROUGH. Permanent service aerodrome, available for civil machines in emergency only, adjoining Farnborough and 2 miles from Aldershot. Nearest railway station, Farnborough (S.R.), 1 mile.

FELIXSTOWE. Permanent service seaplane station, available for civil machines in emergency only, 2 miles from Felixstowe town and station (L.N.E.R.).

FILTON. Civil aerodrome, licensed for all types of machines, 5 miles from Bristol. Nearest railway stations are Filton (G.W.R.), 1 mile, and Bristol (G.W.R. & L.M.S.R.), 5 miles. Training aerodrome for R.A.F. Reserve Officers, operated by the Bristol Co.

GOSPORT. Permanent service aerodrome, available for civil machines in emergency only, 1 mile from Gosport. Fort Brockhurst railway station (S.R.) adjoins the aerodrome.

GRAIN. Permanent service aeroplane and seaplane station, available for civil machines in emergency only; adjoining Port Victoria railway station (S.R.). The nearest towns are Sheerness, 2 miles by water, and Rochester and Chatham, 11½ miles and 12½ miles respectively by road.

HALTON. Permanent service aerodrome, available for civil machines in emergency only, 4½ miles from Aylesbury. Nearest railway station, Wendover (L.N.E.R.), 2 miles.

HAMBLE. There are two unlicensed private aerodromes at Hamble, one for aeroplanes and seaplanes, owned by A. V. Roe & Co., Ltd., and the other for seaplanes only, owned by the Fairey Aviation Co., Ltd. They are available for civil machines only by special permission of the owners, or in emergency. In each case the distance from the nearest town, Southampton, is 6 miles, and from the nearest railway station, Netley (S.R.), 2 miles.

HAWKINGE. Permanent service aerodrome, available for civil machines in emergency only, 3 miles from Folkestone. Nearest railway station, Folkestone Central (S.R.), 3 miles.

HENDON. Civil aerodrome licensed for all types of machines, 1½ miles from Hendon. There are three railway stations, Hendon (L.N.E.R. & L.M.S.R.), 1¼ miles; Edgware (L.N.E.R.), 2 miles; and Golders Green tube station, 2 miles. London (Charing Cross) is 9 miles to the south-east of the aerodrome.

HENLOW. Permanent service aerodrome, available for civil machines in emergency only; adjoining Henlow railway station (L.M.S.R.). Nearest towns, Hitchin, 5 miles; Biggleswade, 6 miles; and Bedford, 12 miles.

KENLEY. Permanent service aerodrome, available for civil machines in emergency only, 2 miles from Caterham and 4½ miles from Croydon. Nearest railway stations, Upper Warlingham (S.R.), 1 mile, and Whyteleafe (S.R.), ¾ mile.

LEE-ON-SOLENT. Permanent service seaplane station, available for civil machines in emergency only, ½ mile from Lee-on-Solent railway station (S.R.). Nearest towns, Portsmouth, 11 miles; Gosport, 4 miles; and Southampton, 11 miles.

LEUCHARS. Permanent service aerodrome, available for civil machines in emergency only, 6 miles from St. Andrews. Nearest railway station, Leuchars Junction (L.N.E.R.), ½ mile.

LEYSDOWN. Permanent service aerodrome, available for civil machines in emergency only, 10 miles from Sheerness. Connected by the Sheppey Light Railway with Queenborough railway station (S.R.), 8½ miles.

LITTLESTONE. Emergency landing ground, 7 miles from Hythe. Nearest railway station, New Romney (S.R.), 1½ miles. No accommodation for aircraft exists.

LYMPNE. Civil aerodrome, with accommodation, 3½ miles from Hythe and 9 miles from Folkestone. Nearest railway station, Westenhanger (S.R.), 1½ miles. Customs station.

MANCHESTER. Civil aerodrome, with accommodation, 3 miles from Manchester. Nearest railway station, Alexandra Park (L.N.E.R.), ½ mile.

MANSTON. Permanent service aerodrome, available for civil machines in emergency only, 2 miles from Minster and 3 miles from Ramsgate. Nearest railway stations, Minster (S.R.), 2 miles; and Birchington (S.R.), 3 miles.

MARDEN. Emergency landing ground, 8 miles from Maidstone. Nearest railway station, Marden (S.R.), 1½ miles. No accomodation for aircraft exists.

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BRITISH EMPIRE.—*continued.*

MARTLESHAM. Permanent service aerodrome, available for civil machines in emergency only, 5 miles from Ipswich. Nearest railway stations, Bealings (L.N.E.R.), 1 mile, and Woodbridge (L.N.E.R.), 4 miles.

NETHERAVON. Permanent service aerodrome, available for civil machines in emergency only, 13 miles from Salisbury. Nearest railway stations, Bulford (S.R.), 4 miles, and Pewsey (G.W.R.), 8 miles.

NORTHFIELD. Unlicensed private aerodrome, owned by the Austin Motor Co., Ltd., available for civil machines only by special permission of the owners, or in emergency. Nearest town, Birmingham, 6 miles. Nearest railway station, Northfield (L.M.S.R.), ½ mile.

NORTHOLT. Permanent service aerodrome, available for civil machines in emergency only, 4 miles from Uxbridge and 5 miles from Harrow. Nearest railway stations, Northolt Junction (G.W.R. & L.N.E.R.), ½ mile, and Ruislip (Met. and District), 1½ miles.

OLD SARUM. Permanent service aerodrome, available for civil machines in emergency only, 2½ miles from Salisbury town and railway station (S.R.).

ORFORDNESS. Permanent service aerodrome, available for civil machines in emergency only, 12 miles from Woodbridge and 18 miles from Ipswich. Nearest railway stations, Aldeburgh (L.N.E.R.), 5 miles, and Woodbridge (L.N.E.R.), 14 miles.

PENSHURST. Aerodrome available in emergency only, 5 miles from Tonbridge and 7 miles from Sevenoaks. Nearest railway station, Penshurst (S.R.), ¼ mile.

PULHAM. Airship station temporarily retained for service purposes, available for civil machines in emergency only, 3 miles from Hartlestone and 16 miles from Norwich. Nearest railway station, Pulham St. Mary (L.N.E.R.), ¾ mile.

RENFREW. Civil aerodrome with accommodation, 1 mile from Renfrew and 1½ miles from Paisley. Nearest railway station, Renfrew (L.M.S.R.), 1 mile.

SHOTWICK. Permanent service aerodrome, available for civil machines in emergency only, 6 miles from Chester. Nearest railway station, Queensferry (L.M.S.R.), 2 miles. Welsh Road, Holt (L.N.E.R.) on aerodrome.

SOUTHAMPTON. See Woolston.

SPITTLEGATE. Permanent service aerodrome, available for civil machines in emergency only, 2 miles from Grantham town and railway station (L.N.E.R.).

STAG LANE. (Edgware) Civil aerodrome, licensed for all types of machines, 9 miles from London (Charing Cross). Nearest railway station, Edgware (L.N.E.R.), 1 mile. R.A.F. Reserve training station operated by the De Haviland Co.

UPAVON. Permanent service aerodrome, available for civil machines in emergency only, 5 miles from Pewsey and 15 miles from Salisbury. Nearest railway station, Pewsey (G.W.R.), 6 miles.

WADDON. London Terminal Civil Aerodrome, with accommodation, 2½ miles from Croydon and 12 miles from London (Charing Cross). Nearest railway stations, Waddon (S.R.), ½ mile, and East Croydon (S.R.), 2 miles.

WHITLEY (Coventry).—Test aerodrome and R.A.F. Reserve training station operated by Armstrong, Whitworth Aircraft Ltd.

WITTERING. Aerodrome available in emergency only, 9½ miles from Peterborough. Nearest railway station, Stamford (L.N.E.R. & L.M.S.R.), 2½ miles.

WOOLSTON. Unlicensed private seaplane station, available for civil machines only by special permission of the owners, the Supermarine Aviation Works, Ltd., or in emergency, ¼ mile from Southampton. Nearest railway stations, Woolston (S.R.), ¼ mile, and Southampton Docks (S.R.), ¾ mile by ferry and road.

WORTHY DOWN. Permanent service station, available for civil machines in emergency only, 5 miles from Winchester. Nearest railway stations, Kingsworthy (S.R.), 2½ miles, and Winchester (S.R.), 4½ miles.

YEOVIL. Civil aerodrome licensed for all but the largest types of machines, ½ mile from Yeovil town and station (S.R. & G.W.R.).

BRITISH AIRCRAFT CARRIERS.

(From Jane's "All The World's Fighting Ships.")

The following are the aircraft-carrying ships owned by the British Navy :—

HERMES.

Begun, 15th Jan., 1918, by Sir W. G. Armstrong-Whitworth & Co., Ltd., Newcastle-upon-Tyne. Completed by Devonport Dockyard.

Displacement : 10,950 tons normal.
Length, p.p. : 548 ft.
Length, o.a. : 594½ ft.
Beam, outside bulges : 70 ft.
Beam, over flying deck : 90 ft.
Draught, mean : 18¾ ft.
Machinery : Parsons turbines.
Designed S.H.P. : 40,000.
Speed : 25 kts.
Guns : 10—5.5 in., 4—4 in. AA.
Complement : 570 R.N., 130 R.A.F., 20 Aircraft.

The "Hermes" is the first vessel specially designed by the Admiralty as an aircraft-carrier. She has one long flying-deck, with single funnel, tripod mast and all superstructure carried right over on her starboard beam.

EAGLE.

Designed and begun by Sir W. G. Armstrong-Whitworth & Co., Ltd., in Feb., 1913, for Chile, as Dreadnought battleship "Almirante Cochrane." Bought from Chile, after lying on slip since Aug., 1914, in 1917. Modified as aircraft-carrier and commissioned for ship and flying trials, April, 1920. As result of trials, put in hand in Nov., 1920, at H.M. Dockyard, Portsmouth for modifications. Delivered March, 1923. Commissioned Sept. 19, 1923.

Has one long flying deck, with two funnels, tripod mast and all superstructure mounted on extreme starboard beam.

Displacement : 2',790 tons.
Length, p.p. : 625 ft.
Length, o.a. : 661 ft.
Beam, outside bulges : 104 ft.
Beam, outside flying deck : 100 ft.
Draught, mean : 24 ft.
Draught, max. : 27 ft.
Machinery : Brown-Curtiss turbines.
Designed S.H.P. : 55,000.
Speed : 24 kts.
Guns : 12—6 in., 4—4 in. AA.
Fuel : Coal and oil.
Complement : R.N. 450, R.A.F. —.

ARGUS.

Begun in 1914 by William Beardmore & Co., Ltd., Dalmuir, for Italian Lloyd Sabaudo Line, as S.S. "Conte Rosso." All work ceased in 1914, purchased in 1916 and converted to aircraft carrier. Completed in Sept., 1918. As a mobile hangar and floating aerodrome has proved very successful. Consists of one long flying deck. Horizontal smoke ducts, with expelling fans, carry smoke out over the stern. Further modifications made in 1920, which considerably enhanced her usefulness. Recommissioned Jan. 6, 1921.

Displacement : 14,450 tons.
Length, p.p. : 535 ft.
Length, o.a. : 565 ft.
Beam : 68 ft.
Draught, mean : 21 ft.
Machinery : Parsons turbines.
Designed S.H.P. : 22,000.
Speed : 20.5 kts.
Guns : 2—4 in., 4—4 in. A.A., 15 M.G.
Fuel : Oil only.
Complement : R.N. 300, R.A.F. —, Aircraft 20.

FURIOUS.

Begun in June, 1915, by Sir W. G. Armstrong-Whitworth & Co., Ltd., as a modified "Courageous," enlarged light cruiser, but altered to an aircraft carrier. At first only had a forward flying-off deck and hangar in place of fore 18 in. gun barbette. Later fitted with aft landing deck in place of aft 18 in. gun barbette, and the secondary armament was re-distributed. Is now undergoing alteration and re-fit, after which her appearance will be altered completely. Single funnel and tripod mast have been removed and new hangar built forward.

Displacement 19,100 tons.
Length, p.p. : 735 ft.
Length, o.a. : 786¼ ft.
Beam, outside bulges : 88 ft.
Draught, mean : 21⅝ ft.
Machinery : Brown-Curtiss turbines.
Designed S.H.P. : 90,000.
Speed : 32·33 kts.
Guns : 10—5.5 in., 5—3 in. A.A., 2—3 pdr.
Fuel : Oil only.
Complement : R.N. 820, R.A.F. —.

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BRITISH EMPIRE—*continued.*

PEGASUS.

Built by John Brown & Co., Ltd., Clydebank, as G.E. Railway Co's. S.S. "Stockholm." Purchased under construction in 1917. Has light flying-off deck forward and hangar aft, otherwise retains her original appearance. Now on duty in East Indian waters.

Displacement : 3,070 tons.
Length, p.p. : 330 ft.
Length, o.a. : 332 ft.
Beam : 43 ft.
Draught, mean : 15⅜ ft.
S.H.P. : 9,500.
Speed : 20-25 kts.
Guns : 4—12 pdr., 2—12 pdr. A.A.
Machinery : Brown-Curtiss turbines.
Fuel : Oil only.
Complement : R.N. 280, R.A.F. —.

ARK ROYAL.

Built by the Blyth Shipbuilding & Dry Docks Co., Ltd., Blyth, in 1914, as an oil tanker. Purchased under construction in 1914. Forward tank space fitted up as hangars. Two steam cranes mounted midships. Funnel, masts and superstructure right aft.

Displacement : 7,080 tons.
Length, p.p. : 352½ ft.
Length, o.a. : 366 ft.
Beam : 50⅝ ft.
Draught, mean : 17½ ft.
Machinery : Vertical triple expansion.
I.H.P. : 3,000.
Speed : 11 kts.
Guns : 4—12 pdr., 2 M.G.
Fuel : Oil only.
Complement : R.N. 130, R.A.F. —.

VINDICTIVE.

"Vindictive" is officially rated as a "Light Cruiser fitted as Aircraft Carrier." Has been used for carrying relief crews, and has not carried aircraft since 1918, but it is reported that experiments are being resumed after certain dockyard alterations.

"Courageous" and "Glorious," enlarged light cruisers, are to be converted to aircraft carriers, presumably similar to "Furious," to which class she originally belonged, and have been put in hand at H.M. Dockyards at Rosyth and Devonport respectively.

Various light cruisers of the "D" class have accommodation for single aircraft. The "Dragon" and "Dauntless" have a hangar under the bridge, and the "Dunedin" class have a revolving platform amidships. "Carlisle" and "Capetown" originally had a hangar forward, but this has been removed and replaced by a standard bridge.

AIR ESTIMATES, 1924-5.

Gross Air Estimates, £19,392,000.
8 new squadrons to be formed.
Personnel increased from 33,000 to 35,000.
134 extra commissioned officers.
135 extra N.C.Os.
2086 extra airmen.

Principal Items.

Vote 1.—Air Force Pay		£2,941,000
Vote 2.—Quartering and Stores		£1,452,000
Vote 3.—Technical and Warlike Stores :—		
Section A.—Aeroplanes, seaplanes, engines and spares	£5,144,500	
Section B.—R.A.E.	£40,000	
Section C.—A.I.D.	£135,000	
Section D.—Technical and warlike stores	£94,500	
Section E.—Armament and ammunition	£388,000	
Section F.—Electrical stores	£204,000	
Section G.—Research	£264,000	
Section K.—Mechanical and other transport	£293,000	
Total :		£5,700,000
Vote 4.—Works and Buildings		£2,127,000
Vote 5.—Medical Services		£177,500
Vote 6.—Educational Services		£17,500
Vote 7.—Auxiliary and Reserve Forces		£284,000
Vote 8.—Civil Aviation		£355,000
Vote 9.—Meteorological and Miscellaneous Services		£134,000
Vote 10.—Air Ministry		£710,000

THE COMPOSITION OF THE ROYAL AIR FORCE.

(Corrected from the "Air Force List" of May, 1924.)

THE AIR COUNCIL.

President of the Air Council :—Brig.-Gen. the Rt. Hon. Lord Thomson, P.C., C.B.E., D.S.O., Secretary of State for Air.

Vice-President of the Air Council :—Wm. Leach, Esq., M.P., Under-Secretary of State for Air.

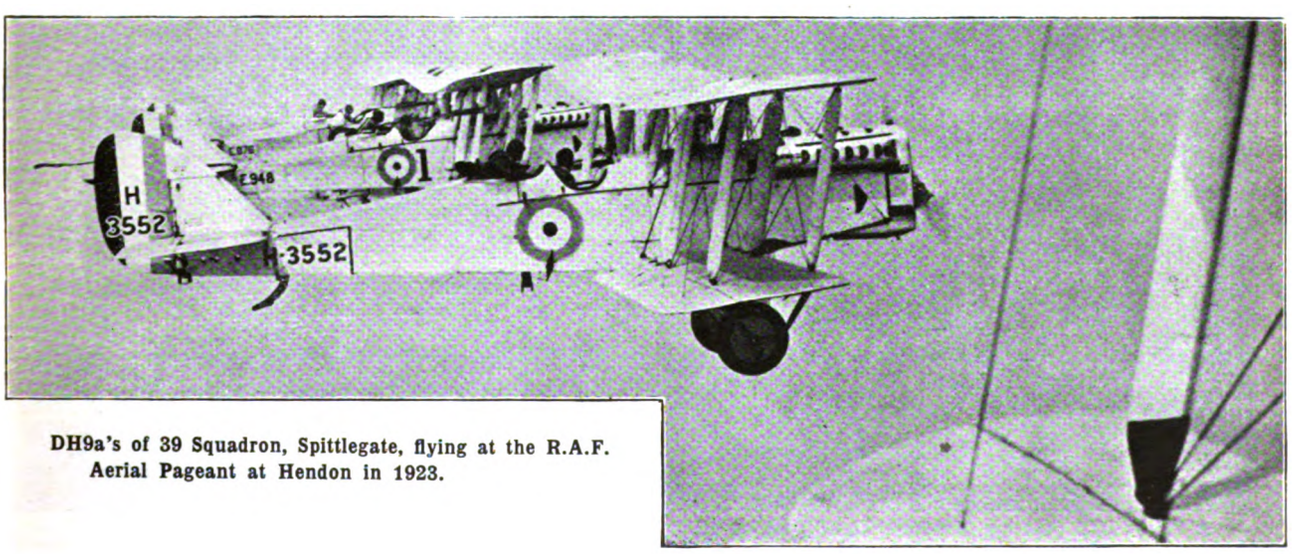
Air Chief Marshal Sir H. M. Trenchard, Bart., G.C.B., D.S.O., A.D.C., Chief of the Air Staff.

Air Vice-Marshal P. W. Game, C.B., D.S.O., p.s.c., Air Member for Personnel.

Air Vice-Marshal Sir W. G. H. Salmond, K.C.M.G., C.B., D.S.O., p.s.c. Air Member for Supply and Research.

Air Commodore J. M. Steel, C.B., C.M.G., C.B.E., Deputy Chief of the Air Staff.

Sir W. F. Nicholson, K.C.B., Secretary of the Air Ministry.



DH9a's of 39 Squadron, Spittlegate, flying at the R.A.F. Aerial Pageant at Hendon in 1923.

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BRITISH EMPIRE—*continued.*

THE DEPARTMENT OF THE UNDER SECRETARY OF STATE FOR AIR.

Directorate of Civil Aviation.

Director :—Air Vice-Marshal, Sir. W. S. Brancker, K.C.B., A.F.C.

Deputy Director of Air Transport :—I. A. E. Edwards, Lt.-Col., C.M.G.

THE DEPARTMENT OF THE SECRETARY OF THE AIR MINISTRY.

Secretary :—Sir W. F. Nicholson, K.C.B.

Deputy Secretary :—Sir S. Dannreuther, C.B.

Principal Assistant Secretaries :—H. W. W. McAnally, Esq., C.B., B. E. Holloway, Esq., C.B., J. A. Webster, Esq., C.B., D.S.O.

Directorate of Accounts.

Director :—J. S. Ross, Esq., C.B.E.

Directorate of Contracts.

Director :—C. R. Brigstoke, Esq., C.B.

Meteorological Office.

Director :—G. C. Simpson, Esq., C.B.E., D.Sc., F.R.S.

THE ROYAL AIR FORCE.

Chief of the Royal Air Force :—THE KING.

Secretary of State for Air :—Brig.-Gen the Rt. Hon. Lord Thomson, P.C., C.B.E., D.S.O.

AIR MINISTRY.

Under Secretary of State for Air :—Wm. Leach, Esq., M.P.

Secretary of the Air Ministry :—Sir W. F. Nicholson, K.C.B.

DEPARTMENT OF THE CHIEF OF THE AIR STAFF.

Chief of the Air Staff :—Air Chief Marshal Sir H. M. Trenchard, Bart., G.C.B., D.S.O., A.D.C.

Directorate of Operations and Intelligence.

Director and Deputy Chief of the Air Staff :—Air Commodore J. M. Steel, C.B., C.M.G., C.B.E.

Directorate of Organisation and Staff Duties.

Director :—Air Vice-Marshal Sir I. L. B. Vesey, K.B.E., C.B., C.M.G., D.S.O., p.s.c.

Directorate of Works and Buildings.

Director of Works and Buildings :—Sir Andrew M. Stuart, Maj.-Gen., K.C.M.G., C.B.

DEPARTMENT OF THE AIR MEMBER FOR PERSONNEL.

Air Member for Personnel :—Air Vice-Marshal P. W. Game, C.B., D.S.O., p.s.c.

Directorate of R.A.F. Medical Services.

Director :—Air Commodore D. Munro, C.B., C.I.E., M.B., M.A., F.R.C.S. (E).

DEPARTMENT OF THE AIR MEMBER FOR SUPPLY AND RESEARCH.

Air Member for Supply and Research :—Air Vice-Marshal Sir W. G. H. Salmond, K.C.M.G., C.B., D.S.O.

Director of Technical Development :—Air Commodore F. C. Halahan, C.M.G., C.B.E., D.S.O., M.V.O.

Director of Scientific Research :—(not yet appointed).

Directorate of Equipment.

Director :—Air Commodore D. le G. Pitcher, C.M.G., C.B.E., D.S.O.

AREA COMMANDS (United Kingdom).

INLAND AREA (Uxbridge).

Air Officer Commanding :—Air Commodore T. I. Webb-Bowen, C.B., C.M.G.

(Units administered direct by Area Headquarters.)

Royal Air Force Depot, Uxbridge.
Royal Air Force Central Band, Uxbridge.
Inland Area Aircraft Depot, Henlow, Beds.
M.T. Repair Depot, Shrewsbury.
Central Trade Test Board.

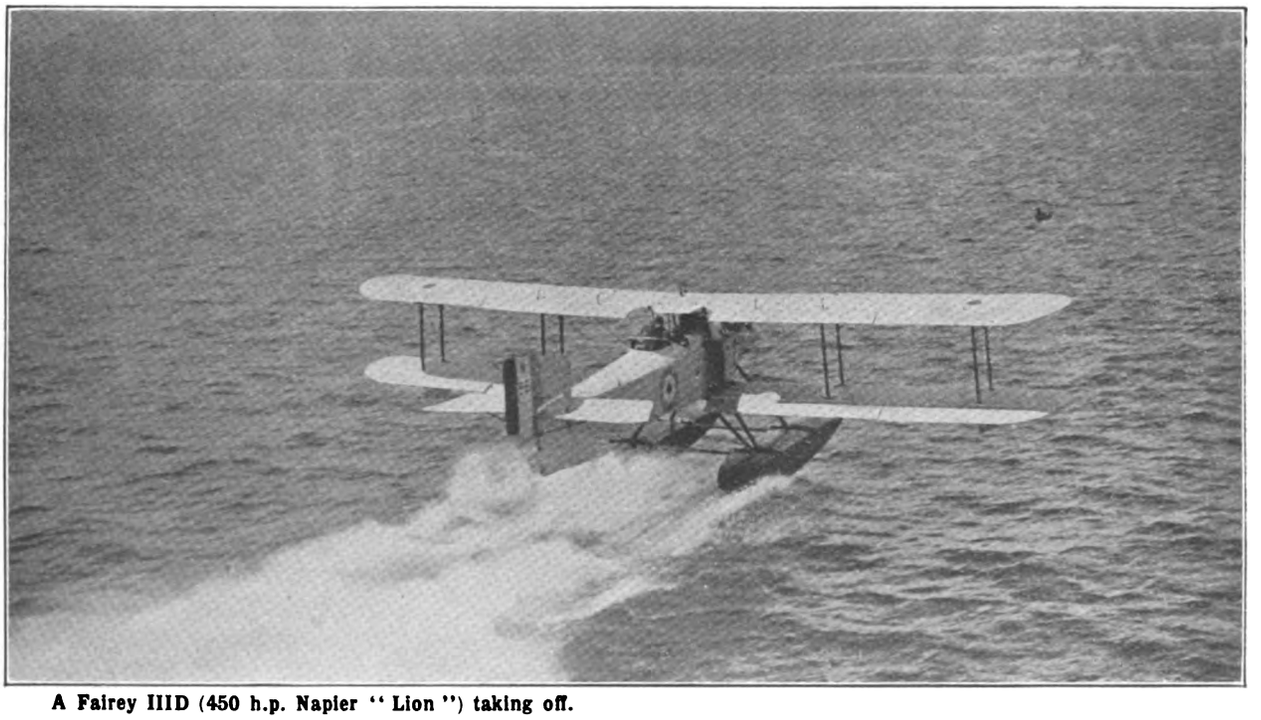
No. 1 Group (Kenley).

Air Commodore C. R. Samson, C.M.G., D.S.O., A.F.C.

Armament and Gunnery School ..	Eastchurch.
School of Technical Training ..	Manston.
No. 1 Stores	Kidbrooke.
Port Detachment Depôt	South Dock, West India Dock, E.14.
Medical Stores Depôt	Shed M, Kidbrooke, S.E.3.
No. 4 Stores Depôt	Ickenham, Ruislip.
The Packing Depôt	West Ascot.
Record Office	Ruislip.
No. 3 Stores Depôt	Milton.
No. 207 (Bombing) Squadron	Eastchurch.
No. 3 (Army Co-operation) Squadron	Manston.
No. 9 (Bombing) Squadron .. .. (H.Q. and 1 Flight)	Manston.

No. 3 Group (Spittlegate).

No. 39 (Bombing) Squadron	Spittlegate.
No. 100 (Bombing) Squadron	Spittlegate.
Care and Maintenance Party	Digby.
Aeroplane and Armament Experimental Establishment	Martlesham.
(*a*) No. 15 (Bombing) Squadron ..	Martlesham.
(*b*) No. 22 (Bombing) Squadron ..	Martlesham.
(*c*) Guard	Orfordness.
No. 7 (Bombing) Squadron	Bircham Newton.
No. 11 (Bombing) Squadron	Bircham Newton.
No. 2 Flying Training School	Duxford.
No. 19 (Fighter) Squadron .. .. (1 Flight)	Duxford.
No. 29 (Fighter) Squadron .. .. (1 Flight)	Duxford.
No. 111 (Fighter) Squadron .. .. (H.Q. and 2 Flights)	Duxford.
No. 5 Flying Training School	Shotwick.
No. 2 Stores (Ammunition) Depôt ..	Altrincham.



A Fairey IIID (450 h.p. Napier "Lion") taking off.

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BRITISH EMPIRE—*continued.*

Fairey IIID's of No. 481 Flight, Calafrana, Malta, lined up for inspection by H.M. The Queen of Roumania.

No. 6 Group (Kenley).

No. 24 (Communication) Squadron ..	Kenley.
No. 32 (Fighter) Squadron .. .. (H.Q. and 2 Flights)	Kenley.
No. 13 (Army Co-operation) Squadron	Kenley.
No. 56 (Fighter) Squadron	Biggin Hill.
No. 41 (Fighter) Squadron	Northolt.
Inland Area Communication Flight ..	Northolt.
Superintendent of R.A.F. Reserve ..	Northolt.
No. 25 (Fighter) Squadron	Hawkinge.
No. 17 (Fighter) Squadron .. .. (H.Q. and 1 Flight)	Hawkinge.

No. 7 Group (Andover).

Air Commodore E. A. D. Masterman.

School of Photography	South Farnborough.
Experimental Section (R.A.E.) ..	South Farnborough.
No. 4 (Army Co-operation) Squadron	South Farnborough.
No. 1 Flying Training School	Netheravon.
School of Army Co-operation	Old Sarum.
Central Flying School	Upavon.
Staff College	Andover.
Electrical and Wireless School	Flowerdown.
(*a*) Detachment	Worthy Down.
School of Balloon Training	Larkhill.
No. 99 (Bombing) Squadron	Netheravon.
No. 16 (Army Co-operation) Squadron	Old Sarum.
No. 3 (Fighter) Squadron .. .. (H.Q. and 1 Flight)	Upavon.
No. 12 (Bombing) Squadron .. .. (H.Q. and 2 Flights)	Andover.
No. 58 (Bombing) Squadron .. .. (H.Q. and 1 Flight)	Worthy Down.

COASTAL AREA (Tavistock Place, London).

Air Officer Commanding :—Air Vice-Marshal Sir A. V. Vyvyan, K.C.B., D.S.O.

(Units administered direct by Area Headquarters.)

Inspector of Recruiting	4, Henrietta Street, W.C.2.
Air Ministry Wireless Section	Air Ministry, Kingsway, W.C.2.
R.A.F. Central Hospital	Finchley.
Research Laboratory and Medical Officers' School of Instruction ..	Hampstead.
Central Medical Board	Hampstead.
Marine and Armament Experimental Establishment	Felixstowe.
Flying-boat Development Flight ..	Felixstowe.
R.A.F. Base	Leuchars.

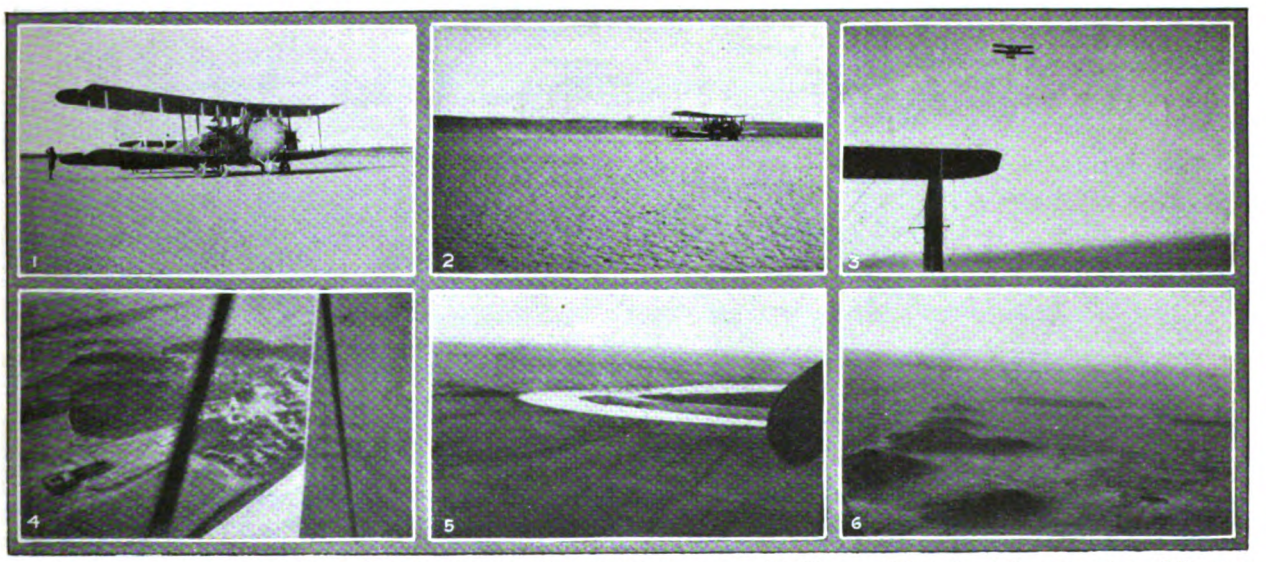
(*a*) Headquarters.
(*b*) No. 401 (Fleet Fighter) Flight. (6 Nightjars).
(*c*) No. 402 (Fleet Fighter) Flight. (6 Flycatchers).
(*d*) No. 403 (Fleet Fighter) Flight. } (6 Plovers or Flycatchers).
(*e*) No. 404 (Fleet Fighter) Flight. }
(*f*) No. 440 (Fleet Reconnaissance) Flight. (6 Seagulls).
(*g*) No. 441 (Fleet Reconnaissance) Flight. (6 Panthers).
(*h*) No. 442 (Fleet Reconnaissance) Flight. (6 Panthers).
(*a*) R.A.F. complements in Aircraft Carriers, H.M.S. "Argus," H.M.S. "Eagle," H.M.S. "Hermes."

No. 10 Group (Lee-on-Solent).

Group Capt. :—J. L. Forbes, O.B.E.

R.A.F. Base	Calshot.

(*a*) Headquarters.
(*b*) No. 480 (Flying-boat) Flight. (5—F5's).



The Cairo-Baghdad Route.—(1) A Vickers "Vernon" on landing ground "D" a mud flat about three-quarters of the way out from Cairo. (2) Another view of the same mud flat. (3) H.M. Air Mail nearing landing ground "G." (4) Ramadi at dusk on the last stage of the journey to Baghdad. (5) Fellujah at bend of river from a height of 2,000 ft. (6) The end of the lava country near landing ground "G."

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BRITISH EMPIRE—*continued.*

A Fairey IIID coming ashore at Calafrana, Malta.

(*c*) H.Q. Training Squadron.
(*d*) Air Pilotage Flight. (4 F5's).
(*e*) Seaplane Training Flight. 3—IIID's, 2 F5's).
(*f*) Marine Training Section.

School of Naval Co-operation .. .. Lee-on-Solent.
R.A.F. Base .. .. Gosport.
(*a*) Headquarters.
(*b*) No. 420 (Fleet Spotter) Flight. (6 Walrus).
(*c*) No. 421 (Fleet Spotter) Flight. (6 Walrus).
(*d*) No. 422 (Fleet Spotter) Flight. (6 Blackburn).
(*e*) No. 423 (Fleet Spotter) Flight. (6 Bison).
(*f*) No. 460 (Fleet Torpedo) Flight. (6 Darts).
(*g*) No. 461 (Fleet Torpedo) Flight. (6 Darts).
(*h*) Development Flight.
Care and Maintenance Party .. .. Cattewater.

ROYAL AIR FORCE, CRANWELL (Cranwell).

Air Officer Commanding :—Air Commodore A. E. Borton, C.B., C.M.G., D.S.O., A.F.C.
(*a*) Cadet College.
(*b*) Boys' Wing.
(*c*) Band.
(*d*) Hospital.

ROYAL AIR FORCE, HALTON (Halton).

Air Officer Commanding :—Air Commodore C. L. Lambe, C.B., C.M.G., D.S.O.
No. 1 School of Technical Training (Boys).
R.A.F. Hospital.

ROYAL AIR FORCE, MIDDLE EAST (Cairo).

Air Officer Commanding :—Air Vice-Marshal Sir O. Swann, K.C.B., C.B.E.
(Units administered direct by Command Headquarters.)

Aircraft Depôt .. .. Aboukir.
Stores Depôt .. .. Aboukir.
(*a*) Port Detachment .. .. Alexandria.
Engine Repair Depôt .. .. .. Abbassia (Cairo).
Aden Flight .. .. Aden.
(*a*) Detachment .. .. .. Somaliland.

Egyptian Group (Heliopolis).

No. 47 (Bombing) Squadron .. .. Helwan.
No. 216 (Bombing) Squadron .. .. Heliopolis.
No. 2 Armoured Car Co. .. .. Heliopolis.
No. 4 Flying Training School .. .. Abu Sueir.
No. 208 (Bombing) Squadron .. .. Moascar.

Palestine Command.

Headquarters .. .. Bir Salem.
No. 14 (Army Co-operation) Squadron Ramleh.
No. 2 Armoured Car Co. .. .. Sarafand.
(*a*) "D" Armoured Car Section .. Jerusalem.
(*b*) Repair Section .. .. .. Sarafand.
(*c*) Transport Section .. .. Sarafand.
Supply Depôt .. .. Sarafand.
Palestine General Hospital .. .. Ludd.
Combined Hospital .. .. .. Jenin.

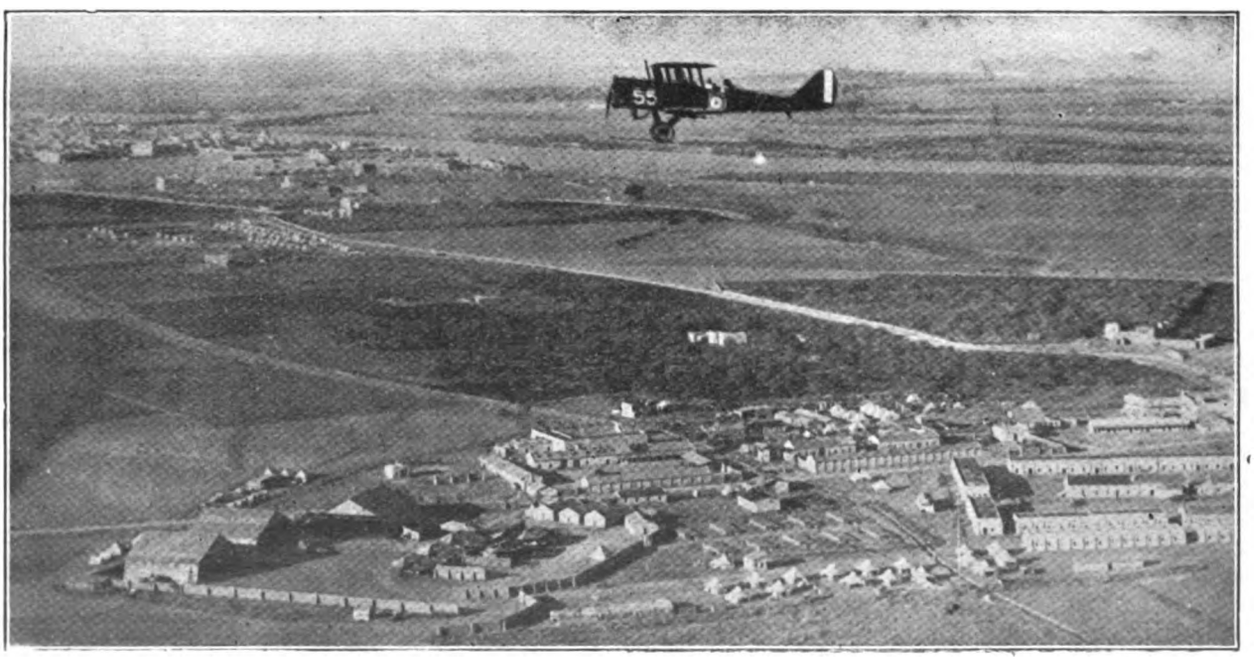
R.A.F. Transjordania.

Headquarters .. .. Amman.
Flying Section .. .. Amman.
Section of No. 2 A.C.C. .. .. Amman.

IRAQ COMMAND.

Headquarters .. .. Baghdad City.
Air Marshal Sir John Salmond, K.C.B., C.M.G., C.V.O., D.S.O.
[NOTE.—Sir John Salmond has since returned to England to form and command the new Home Defence Area. He has been succeeded in Iraq by Air Vice-Marshal J. F. A. Higgins, C.B., D.S.O.]

No. 1 (Fighter) Squadron .. .. Hinaidi, Baghdad.
No. 6 (Co-operation) Squadron .. Hinaidi.
No. 8 (Bombing) Squadron .. .. Hinaidi.
No. 30 (Bombing) Squadron .. .. Hinaidi.
No. 55 (Bombing) Squadron .. .. Mosul.
Stores Depôt .. .. Magil, Basrah.
Aircraft Depot .. .. Hinaidi.



A DH9a of 55 Squadron over Mosul Aerodrome.

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BRITISH EMPIRE—*continued.*

Station Commandant	Hinaidi.
H.Q. Accountant Office	Baghdad.
Brigade Accountant Office	Baghdad.
No. 70 (Bombing) Squadron	Hinaidi.
No. 45 (Bombing) Squadron	Hinaidi.
Combined Hospital	Hinaidi.
Central Supply Depôt	Hinaidi.
Petrol Dump	Hinaidi.
Supply Depôt	Mosul.
Inland Water Transport (Det.)	Baghdad.

Armoured Car Wing.

Headquarters	Southgate, Baghdad.
No. 3 Armoured Car Co.	Makina, Basrah.
No. 4 Armoured Car Co.	Hinaidi.
No. 5 Armoured Car Co.	Mosul.
No. 6 Armoured Car Co.	Hinaidi.

Basrah Group.

Headquarters	Basrah.
Rest Camp	Magil, Basrah.
R.A.F. Prison	Makina, Basrah.
Stores Depôt	Magil, Basrah.
Base Supply Depôt	Magil, Basrah.
Combined Hospital	Ashar, Basrah.
Inland Water Transport	Basrah.
No. 84 (Bombing) Squadron	Shaibar.

R.A.F. INDIA.

Air Officer Commanding :—Air Vice-Marshal Sir E. L. Ellington, C.M.G., C.B.

Aircraft Depôt	Karachi.
(*a*) Port Detachment	Kiamari, Karachi.
Aircraft Park	Lahore.
No. 1 Indian Wing Headquarters	Peshawar.
No. 2 Indian Wing Headquarters	Risalpur.
No. 3 Indian Wing	Quetta.
No. 28 (Army Co-operation) Squadron	Peshawar.
No. 31 (Army Co-operation) Squadron	Ambala.
No. 20 (Army Co-operation) Squadron	Quetta.
No. 5 (Army Co-operation) Squadron	Dardoni.
No. 27 (Bombing) Squadron	Risalpur.
No. 60 (Bombing) Squadron	Risalpur.

R.A.F. MEDITERRANEAN (Valetta, Malta).

Air Officer Commanding :—Group Capt. A. W. Bigsworth, C.M.G., D.S.O., A.F.C.

R.A.F. Base	Calafrana, Malta.
(*a*) No. 481 (Float Plane) Flight. (6—IIIDs.)	
Meteorological Station	Malta.

BRITISH CIVIL AVIATION.

DIRECTORATE OF CIVIL AVIATION.

Director :—Sir W. S. Brancker, Air Vice-Marshal, K.C.B., A.F.C.

Address :—The Air Ministry, Kingsway, W.C. 2.

Aircraft Operating Companies :—

Aerofilms, Ltd. London Aerodrome, Hendon. Carry on business of aerial photography, etc. Operate from Stag Lane Aerodrome, Edgware.

Airco Aerials, Ltd. 15, Furnival Street, Holborn. Carry out aerial photography, etc.

The Aircraft Operating Co., Ltd. 8, New Square, Lincoln's Inn. Formed on January 30th, to carry out contracts in any part of the world for aerial surveys, for the management, operation or agency works of air lines and for the carrying of passengers, freight specie and mails, etc. Directors : A. S. Butler, H. Hemming and T. P. Mills.

The Berkshire Aviation Tours. Formed : 1921. Offices : East Hanney, Wantage. Proprietor : F. J. V. Holmes. Services operated : Joy Rides and Air Tours.

The De Havilland Aircraft Company, Ltd. Services operated : Private hire. The principal business of this Company is the design and manufacture of aircraft. Full details are given in the Manufacturing Section.

Imperial Airways, Ltd. Formed by the amalgamation of Daimler Hire, Ltd., Handley Page Transport, Ltd., The Instone Air Line, Ltd., and The British Marine and Air Navigation Co., Ltd. Directors : The Rt. Hon. Sir Eric Geddes, G.C.B., G.B.E. (Chairman), Sir George Beharrel, Kt., D.S.O., Lt.-Col. Frank Searle (Managing Director), Lt.-Col. Barrett-Lennard, Sir Samuel Instone and Mr. Hubert Scott-Paine. General Manager : Major G. E. Woods Humphery.

Major J. W. Hills and Sir Herbert Hambling have been appointed Government Directors and will join the Board after the allotment of shares.

The Airship Guarantee & Construction Co.

Lieut.-Commander C. Dennis Burney, R.N., M.P., backed by a financial syndicate, has formulated a scheme for an Imperial Airship Service from London to Bombay (5½ days), Rangoon (7½ days), Hong Kong (8½ days), and Australia (11½ days). It is proposed to form a company with a capitalization of £4,000,000 (£1,800,000 in Ordinary Shares and £2,200,000 in Debentures), subject to Government arranging, by means of a subsidy, a guarantee of dividend and interest for a period of years. Vickers, Ltd., have undertaken to subscribe for 100,000 shares at par and the Shell Oil group 100,000 shares or debentures at par.

The North Sea Aerial & General Transport, Ltd. Date of Incorp. : April 23rd, 1919. Registered offices : Olympia, Leeds. Directors : Robert Blackburn, O.B.E., Leonard Oldroyd. Secretary : Edwin Hudson, A.C.I.S. This Company began a service, Leeds—Croydon—Amsterdam, in March, 1920. It was suspended in October of that year and has not been resumed. The Company now operates the R.A.F. Reserve School at Brough.

The Savage Sky-Writing Co. Major J. C. Savage, 7-8, Norfolk Street, Strand, W.C.2.

The Surrey Flying Services. Offices : Croydon Aerodrome, Managers : Capt. A. F. Muir and Mr. G. Grant. Services : Private Hire and Short Flights.

SERVICES OPERATED BY BRITISH AIR LINES IN 1924.

London—Paris. (Imperial Airways, Ltd.) Four services daily in each direction. (Two on Sundays.) Leave Croydon at 04.45 hrs. (Freight Service) (Sundays excepted), 11.50 hrs., 12.00 hrs. and 15.00 hrs. (Sundays excepted). Leave Le Bourget (Paris) at 10.15 hrs. (Sundays excepted), 16.15 hrs., 16.25 hrs. and 18.15 hrs. (Sundays excepted). This line has since been extended to **Bale** and **Zurich.**

London—Ostende—Brussels—Cologne. (Imperial Airways, Ltd.) Three services daily in each direction. (Two on Sundays.) Leave Croydon at 05.00 hrs. (Freight Service) (Sundays excepted) for Ostende and Cologne only, 09.30 hrs. for Brussels and Cologne only, and 09.30 for Cologne only. Leave Cologne at 11.00 hrs. (Sundays excepted) for Croydon only, 14.45 hrs. for Brussels and Croydon only, and 15.15 for Croydon only.

London—Amsterdam—Hanover—Berlin. (Imperial Airways, Ltd., in conjunction with the Deutsche Aero Lloyd, Ltd.) One service daily in each direction (Sundays excepted). Leave Croydon at 08.00 hrs. Leave Berlin at 10.00 hrs.

Southampton—Guernsey (Channel Islands). (Imperial Airways, Ltd.) Two services daily in each direction (one on Sundays). Leave Southampton Port at 07.00 hrs. and 14.00 hrs. (Sundays excepted) and 09.00 hrs. (Sundays only). Leave Guernsey Port at 10.00 hrs. and 17.00 hrs. (Sundays excepted) and 17.00 hrs. (Sundays only).

The Aerial Freighter. A Vickers Vimy-Commercial (2 Rolls-Royce "Eagle" engines) being loaded with goods at the London Air Port, Croydon.

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BRITISH EMPIRE—*continued.*

Northern Air Lines. D. M. Greig and E. Higgs, 17, Donegal Street, Belfast. Incorp.: April, 1924. To operate the Liverpool—Belfast Air Service for the carriage of mail, passengers and merchandise. Machines used: D.H.50 four-seater biplanes (240 h.p. Siddeley "Puma" engine).

"JOY-RIDE" COMPANIES OPERATING IN 1923.

The following joy-ride concerns were licensed to operate during 1923:—

The Berkshire Aviation Tours, East Hannay, Wantage, Berks.

The Kingwill and Jones Flying Co., Turnhouse Aerodrome, Cramond Bridge, nr. Edinburgh.

The Surrey Flying Services, London Terminal Aerodrome, Croydon.

The Northern Aviation Co., 186, Oxford Street, Manchester.

B. Martin, Addison House, Gedling, Notts.

H. B. Elevell, 24, Ormond Avenue, Blackpool.

L. J. Rimmer, 53, Derby Lane, Stonycroft, Liverpool.

P. A. A. Boss, 14, Henry Buildings, Gresse Street, W.1.

F. Neale, Thornwood, Epping, Essex.

E. L. Wilson, Ivy House, Crumlin, Co. Antrim, Ireland.

J. Woods, Arawa, Udny Street, Aberdeenshire.

THE HISTORY OF BRITISH AERONAUTICS IN 1923-24.

[**Note.**—*In the last volume of this work, which appeared in the spring of* 1923, *the history of British Aeronautics was brought up to the end of* 1922. *The following pages deal with the progress of the year* 1923 *and of the first three months of* 1924. *The object of this is to bring the history of British Aeronautics year by year into line with the official financial year, which ends on March* 31*st, so that the information may include the Air Estimates for the year during which the volume is current. As in previous volumes, this section is divided into Service and Civilian Sections.*]

SERVICE AERONAUTICS.

January, 1923.

Nothing of note occurred in the history of Service aeronautics during January. Certain new types of war machines became known, notably the Vickers "Victoria," a large twin-engined troop carrier, the Avro "Bison," a single-engined fleet spotter, and the Bristol "Bullfinch," a single-engined single-seat fighter. The two former had Napier "Lion" engines and the latter a Bristol "Jupiter."

February, 1923.

An Air Ministry statement was issued concerning the constitution of the R.A.F. Reserve of Officers. This indicated that a General Reserve of officer pilots and also of technical officers was to be formed on lines somewhat similar to the Army Reserve of Officers, as distinct from the Militia or Territorials. During the year, training schools were opened for the R.A.F. Reserve at the De Havilland Aerodrome at Stag Lane, the Bristol Aerodrome at Filton, the Armstrong-Whitworth Aerodrome at Coventry, and the Beardmore Aerodrome at Renfrew, where some hundreds of officers appointed to the Reserve were passed through preliminary refresher courses, preparatory to training with R.A.F. squadrons.

On February 14, the Royal Air Force Rugby Team beat the Navy by 3 points to nil, a performance which considerably influenced the general moral of the Air Force.

Another new war machine, the Vickers "Virginia," a twin-engined bomber (Napier "Lion" engines), was made known to the public during the month.

March, 1923.

The Air Force Estimates were presented to the House of Commons on March 8. The gross amount was £18,605,000. Of this, Air Force Pay accounted for £5,370,000, Quartering and Stores for £2,914,000, and Technical and Warlike Stores for £5,594,000.

On March 21, there were debates in the Houses of Lords and Commons on the relative strengths of the air forces of France and Great Britain. These debates were the origin of the later increases in the Royal Air Force for 1924-25.

On March 10, the R.A.F. Rugby Team beat the Army by 2 goals and 1 try to 1 goal, and thus won the Services Championship, a victory which still further enhanced the moral of the R.A.F.

April, 1923.

During April, there was practically nothing of individual importance to record in the history of the R.A.F., but steady expansion and general re-formation took place.

May, 1923.

The question of the R.A.F's weakness in the air was again discussed in the House of Lords on May 9, with salutory effect.

It is to be noted that in the formation of Mr. Baldwin's new Cabinet, during May, the Secretary of State for Air became for the first time a Member of the Cabinet, thus placing the Royal Air Force definitely on the same level with the two Senior Services.

June, 1923.

The King's Birthday Honours included several promotions and awards. Air Vice-Marshal Sir John Salmond, Air Officer Commanding in Iraq, was promoted to the rank of Air Marshal, which promotion gave him substantive rank with, but after, a Lieutenant-General in the Army. Air Vice-Marshal Vyvian was awarded a K.C.B., Air Commodore Longcroft was awarded a C.B., and Air Commodore Halahan was awarded a C.B.E.

On June 26, the Secretary of State for Air made a definite statement in the House of Commons that the Home Defence Force of the R.A.F. was to be increased by 34 squadrons, bringing it up to a total of 52 squadrons.

On June 29, the First Annual Dinner of the R.A.F. Dinner Club took place, with Air Vice-Marshal Geoffrey Salmond in the chair. This was the first dinner of the Club, which had been founded a year before, on the initiative of Wing Commander Christie (now Air Attaché at Washington) and the late Squadron Leader Vyvian Robeson, with the idea of holding an annual gathering of past and present R.A.F. officers on the eve of the R.A.F. Pageant.

On June 30, the Fourth Royal Air Force Pageant took place at Hendon. The flying was of a higher quality than ever, and considerable interest was taken in the various new types of war aircraft which appeared.

During June, several more new types of aircraft became known. Among these were the Parnall "Plover" (a single-seat deck-flying fighter, with an Armstrong-Siddeley "Jaguar" engine), the Fairey "Fawn" (a two-seat fighter, with a Napier "Lion" engine), and a new type of Bristol Fighter, with a Bristol "Jupiter" radial air-cooled engine.

July, 1923.

On July 16, His Royal Highness the Prince of Wales unveiled the R.A.F. Memorial on the Thames Embankment, close to the House of Commons.

The Gloucestershire "Grebe," a new type of single-seat fighter, with a "Jaguar" engine, was made public during the month.

August, 1923.

On August 2, in the House of Commons, Mr. Baldwin, the Prime Minister, announced the Cabinet's decision that the Air Force should remain one and indivisible and should not be split up between the Navy and the Army.

During August, the Air Ministry announced the system of manning the Other Ranks of the R.A.F. with aircraft apprentices trained as boys in the R.A.F. schools at Halton and Cranwell, instead of enlisting grown men who were supposed to be trained mechanics. A number of such boys had been in training for several years before, and the first of these are now passing out to the various squadrons. Their general tone, as well as their mechanical ability, has proved to be so high that the system is to be greatly extended in the future.

September, 1923.

During September nothing of note happened in the history of the R.A.F.

October, 1923.

During October, also, nothing of note happened in the history of the R.A.F.

November, 1923.

On November 10, the Dominion Prime Ministers, who were in London for the Imperial Conference, paid a visit to Croydon, where a miniature air pageant was held, in which the visitors from overseas were afforded the opportunity of seeing all the latest types of war aircraft in the air.

During the month, several important changes in the higher commands of the R.A.F. took place. Sir Vice-Marshal Philip Game was appointed to be Air Member for Personnel on the Air Council, his appointment dating from November 6. Air Vice-Marshal Sir E. L. Ellington was appointed to be Air Officer Commanding in India, as from November 5. Air Vice-Marshal Oliver Swann was appointed to be Air Officer Commanding Middle East, which post he assumed in January, 1924.

December, 1923.

Nothing of importance happened during December. Nevertheless, the whole year 1923 showed remarkable progress in the general tone, in the efficiency and in the equipment of the R.A.F. Big orders were given out for new types of machines and engines, and a vast amount of wartime aeroplanes were reconditioned, which means that they were practically rebuilt.

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BRITISH EMPIRE—*continued.*

The Royal Air Force became the predominant power in Iraq, where Army troops were used almost entirely as guards and hardly ever for actual expeditions. The troublesome tribesmen in the Kurdish Hills and in the Desert were kept in order by brief raids by aircraft, and the Air Force thus demonstrated the efficacy of the system which the Air Minister of the period, Sir Samuel Hoare, described as "control without occupation."

Much similar service was done on the North West Frontier of India by R.A.F. units and on the whole the Frontier remained remarkably quiet. There were a few air operations in Southern Arabia, from Aden, and in the Southern Soudan, from Khartoum.

The chief efforts of the technical side of the R.A.F. were devoted to the production of deck-flying machines for the sea-going side of the R.A.F., which is now known officially as the Fleet Air Arm. Almost every new type of machine produced was intended to fly off and onto the decks of aircraft-carrying ships, though some few float seaplanes were produced and also a few amphibians designed to fly off and onto either the water or the decks of ships. This policy was pursued with the express intention of preventing the Navy from having any justifiable plea to possess its own air service on the grounds that it was not adequately provided by the Air Council. The result was that at the end of the year the Coastal Area, which is the section of the R.A.F. which co-operates with the Navy, was in possession of considerably more machines and personnel than could possibly be accommodated on the aircraft carriers provided by the Navy.

Co-operation with the Army, though on a comparatively small scale owing to the cutting down of the Army itself, was entirely cordial and productive of excellent results.

The Air Ministry notified, in a statement on December 28, that Air Vice-Marshal J. F. A. Higgins, C.B., D.S.O., A.F.C., at that time Air Officer Commanding Inland Area, would succeed Air Marshal Sir John Salmond as Air Officer Commanding all British Forces in Iraq, as from April, 1924.

January, 1924.

In the New Year's Honours List, Air Chief Marshal Sir Hugh Trenchard, Bart., was promoted to G.C.B. (Mily. Divn.). In the same list, Air Vice-Marshal Sir Oliver Swann was promoted to K.C.B. At the same time, Air Commodore David Munro, Chief of the R.A.F. Medical Service, was made a C.B.

On January 3, the Air Ministry issued a statement that 400 Short Service Commissions would be given to flying officers during the year, under the new scheme for the expansion of the R.A.F. This notice produced applications from some 4,000 would-be officer pilots, with the result that the R.A.F. has had the pick of a large number of very excellent young men.

On January 18, the Air Ministry notified that the whole system of aeronautical research was to be reorganised and that instead of having a Director of Research under the Air Member for Supply and Research, there would in future be two departments, one under a Director of Technical Development and one under a Director of Scientific Research.

On January 23, it was announced that Mr. Ramsay MacDonald, Prime Minister of the new Labour Ministry, had appointed to be Secretary of State for Air Brigadier General C. B. Thomson, C.B.E., D.S.O., and that Mr. William Leach was appointed Under-Secretary of State for Air.

February, 1924.

On February 4, it was announced that the King had conferred a Barony of the United Kingdom on Brigadier General C. B. Thomson. In this way the Air Ministry was adequately represented in the House of Lords and in the House of Commons.

On February 19, a debate was opened in the House of Commons on the general state of the Royal Air Force and the lack of adequate air defence for this country.

March, 1924.

On March 7, the Air Estimates were introduced by Mr. Leach. These were, in fact, the Estimates prepared by his predecessor, Sir Samuel Hoare. The whole scheme for the expansion of the R.A.F. was confirmed. The gross amount of the Estimates was £19,392,000. Of this, Air Force Pay amounted to £4,080,000, Quartering and Stores £2,393,000 and Technical and Warlike Stores £7,355,000.

During March, it was officially announced that Major General E. B. Ashmore, C.B., C.M.G., M.V.O., had been appointed General Officer Commanding Territorial Army Air Defence Brigades and Inspector of Regular Army Anti-Aircraft Units.

On March 20, the Auxiliary Air Force and Air Force Reserve Bill was introduced to the House of Lords by the Lord Thomson.

On March 25, Squadron Leader Maclaren, O.B.E., M.C., D.F.C., A.F.C., with Flying Officer Plenderleith and Sergeant Andrews, all on half-pay for the duration of their voyage, left Calshot in a Vickers "Vulture" amphibian flying-boat (Napier "Lion" engine) in an attempt to fly round the world.

CIVIL AVIATION.

January, 1923.

The first event of the year was the arrival, on January 1, at Croydon, of a Dornier "Komet," which was the first German aeroplane to descend voluntarily in England since 1914. Thereafter, throughout the year British aircraft on the Daimler Airway flew regularly to Berlin and were invariably received most amicably at the German aerodromes at Hamburg, Hanover, Bremen and Berlin.

A somewhat remarkable event occurred on January 31, when The De Havilland Aircraft Company Ltd. held their First Annual Dinner to celebrate the fact that in the first two years of their existence they had been able to pay a dividend.

February, 1923.

An Air Conference, lasting three days, was held at the Guildhall, beginning on February 6, when various subjects of more or less importance to Civil Aviation were discussed.

It was announced in a White Paper on February 20, that the Government were prepared to back a scheme involving the loan of a million pounds, to be spread over ten years, for a national air transport company, provided that a similar amount of capital could be found to finance such an undertaking. This scheme was the result of the report of a Committee appointed on January 2 by the Secretary of State for Air. The Committee consisted of Sir Herbert Hambling, J.P., Deputy Chairman of Barclay's Bank, Sir Joseph Broadbank, J.P., lately of the Port of London Authority, and Mr. O. J. G. Hoare, Manager of Cox & Company. This proposal was discussed in its various phases in *The Aeroplane.*

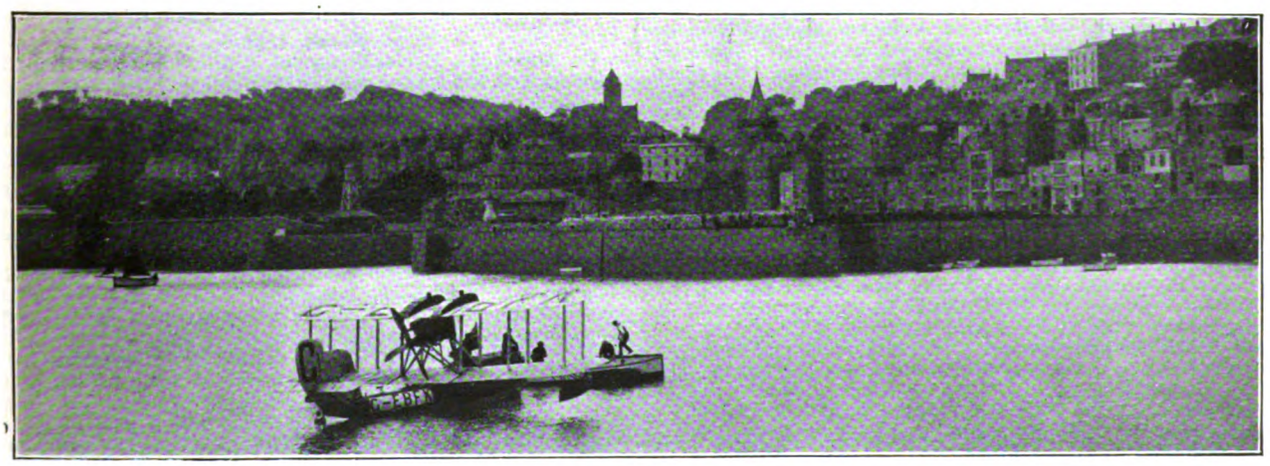
March, 1923.

On March 23, the British Marine Air Navigation Co. Ltd. was registered as a Private Company. This firm was formed by Mr. Hubert Scott Paine (then of the Supermarine Aviation Works Ltd.) in conjunction with the Southern Railway Co. Ltd. Its intention was to organise a flying-boat service between Southampton and Cherbourg and between Southampton and the Channel Islands.

April, 1923.

Light aeroplanes first became prominent during this month. The A.N.E.C. light aeroplane and the English Electric Company's "Wren" were both described and illustrated in *The Aeroplane.*

During February, March and April, a De Havilland "9" fitted with a Siddeley "Puma" engine, piloted by Mr. Alan J. Cobham and carrying Mr. Sharpe, an American citizen, as a



Guernsey Port. Passengers being embarked on a Supermarine "Sea Eagle" (Rolls-Royce engine), belonging to Imperial Airways, Ltd., and used by them on the Southampton—Guernsey service.

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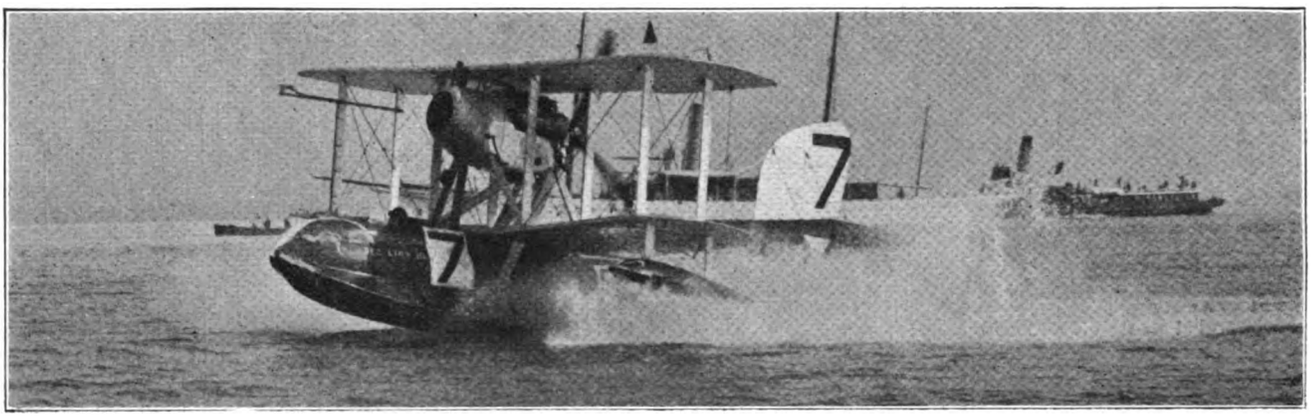
BRITISH EMPIRE—*continued.*



The Supermarine "Sea Lion" (450 h.p. Napier "Lion" engine) taking off in the eliminating trial for the Schneider Trophy at Cowes, Isle of Wight, in September, 1923.

passenger, made a tour of Southern Europe and Northern Africa. In the middle of April, Mr. Cobham's tour, which was intended to extend to India, was stopped in Palestine by the Foreign Office, which forbade a civilian machine from flying over the desert route to Baghdad, owing to local tribal disturbances. The total extent of the tour, which was completed about the end of April, was about 9,000 miles, entirely without accident.

May, 1923.

On May 1, the Daimler Airway opened their extension to Berlin of the London—Amsterdam route. This was operated entirely without serious accident and with great regularity until the closing of the line on March 31, 1924.

Another light aeroplane, the Gnosspelius monoplane, was introduced to the public during the month.

June, 1923.

On June 23, the air race for the Cup presented by the Lord Edward Grosvenor, started from and finished at Lympne Aerodrome. The course was from Lympne to Croydon, Birmingham, Bristol, Croydon and back to Lympne. It was won by Flight-Lieut. Longton on a Sopwith "Gnu," owned by Lieut.-Colonel Frank MacClean.

On June 25, the Prince of Wales opened an International Air Congress, which lasted a week and did much to bring together the leading people in the aeronautical communities of all civilised nations. Receptions were held by the Duke of York, the Duke of Sutherland and the Lord Mayor of London.

July, 1923.

On July 13 and 14, the race for the King's Cup was flown from Hendon to Birmingham, Newcastle, Glasgow, Manchester, Bristol and back to Hendon, and was won by Mr. Frank Courtney, on an Armstrong-Whitworth "Siskin," with an Armstrong-Siddeley "Jaguar" engine. The second man was Mr. Alan Cobham, on a D.H.9 converted by the De Havilland Company to take a Napier "Lion" engine. The third was Mr. Hubert Broad, on a Standard D.H.9c.

August, 1923.

The week ending August 5 was the record passenger-carrying week of the year on the Cross-Channel air lines. 139 machines left Croydon Aerodrome carrying 730 passengers. Of these, 96 were British aeroplanes carrying 638 passengers. The total number of passengers was less than the record week of 1922, ending August 23, when 209 machines carried 734 passengers, of whom 620 were carried on 137 British aeroplanes.

The Aerial Derby was flown on August 6, and was won by Mr. Lawrence Carter, on the Gloucestershire Aircraft Company's "Gloster," with a 450 h.p. Napier "Lion" engine. His speed over the course was 192 miles per hour. The second man was Flight-Lieut. Longton, on the Sopwith "Hawker," with a 400 h.p. "Jupiter" engine. His speed was 163 m.p.h. The handicap in connection with the Aerial Derby was won by Flying Officer Hamersley, on an Avro "Viper," with a 200 h.p. "Viper" engine. His speed was 108.5 m.p.h.

September, 1923.

The great event of September was the race for the Schneider International Seaplane Trophy at Cowes. This race, which had been won the previous year at Naples by a Napier-Supermarine flying-boat, was won by Lieut. David Rittenhouse, of the U.S. Navy, on a Curtiss biplane, with a Curtiss D-12 engine, at a speed of 177.38 miles per hour. Mr. Baird, on the Supermarine, the only British starter, was third, with a speed of 157.17 miles per hour.

October, 1923.

A meeting for light aeroplanes was held at Lympne from October 6 to 13. About fifteen different types of light aeroplanes appeared and most of them behaved very well indeed. The meeting was honoured by the presence of the Duke of York and the Duke of Sutherland. The speed prize was won by Mr. Macmillan, on the Parnall "Pixie." The Duke of Sutherland's Prize and the *Daily Mail* Prize for efficiency were divided between the English Electric Company's "Wren," piloted by Flight-Lieut. Longton, and the A.N.E.C. monoplane, piloted alternately by Mr. J. H. James and Mr. M. W. Piercey. The altitude prize was won by the A.N.E.C. monoplane, piloted by Mr. Piercey, and a second altitude prize was awarded to the Avro biplane, piloted by Mr. Hamersley.

On October 27, there was a meeting for light aeroplanes, held at Hendon, which caused considerable interest among the population of London.

November, 1923.

On November 3, a contract was signed between the Air Ministry and the British Foreign & Colonial Corporation Ltd. for the formation of an air trust to take over the existing air lines and to form the national air transport company (which was later produced under the title of Imperial Airways Ltd.), to which would be allocated the Million Pound Subsidy offered by the Government.

December, 1923.

The only event of note was the holding of the Annual Dinner of the Personnel of the London Terminal Aerodrome at Croydon, at which the Director of Civil Aviation, Major-General Sir Sefton Brancker, presided. The fact that no air-line pilots and only one manager were present and that there was a very poor attendance, provided an omen of the forthcoming industrial unrest.

A notice issued by the Air Ministry on December 28, gave the text of the agreement between the President of the Air Council and the British Foreign & Colonial Corporation Ltd.

January, 1924.

Nothing of note occurred in connection with Civil Aviation, but the existing air lines ran with surprising regularity through the winter weather.

February, 1924.

Nothing of great importance occurred in Civil Aviation during February. The organisation of the National Air Transport Company, which should have been well in hand by this month, was unfortunately delayed, presumably owing to the coming into power of a Labour Government all the financial arrangements and commitments of the nation were suspended until those responsible could form some sort of judgment as to the policy which a Labour Government was likely to pursue.

March, 1924.

On March 31, the existence of a firm known as Imperial Airways Ltd. was made known to the public. The firm registered in this name was in fact the National Air Transport Company, which was to be financed by the British Foreign & Colonial Corporation Ltd. to qualify for the Million Pound Subsidy offered by the Government.

The Directors are :—The Rt. Hon. Sir Eric Geddes, G.C.B., G.B.E., Sir George Beharrell, Kt., D.S.O., Lt.-Col. Frank Searle (Managing Director), Lt.-Col. J. Barrett-Lennard, Sir Samuel Instone, Kt., and Mr. H. Scott-Paine.

Under the agreement between the Air Council and the British Foreign & Colonial Corporation Ltd., the new firm was to take over the running of the British air lines at the beginning of the new financial year, namely on April 1, and a clause in the agreement provided that if they did not do so they were liable to the cancellation of their agreement. A week or two before the new line was supposed to begin flying operations, a dispute arose between the Directors and the pilots and mechanics employed by the three air lines (Handley Page Transport, the Instone Air Line and the Daimler Airway) on the subject of the pay of pilots and mechanics and as to the management of the line.

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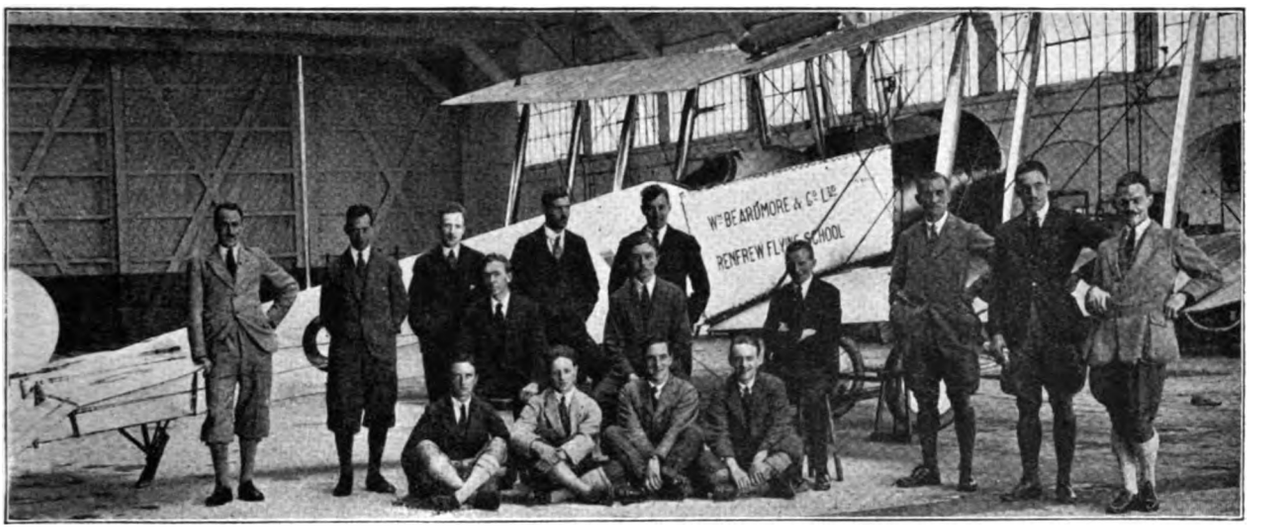
BRITISH EMPIRE—*continued.*



Instructors and Pupils of the R.A.F. Reserve School, operated by Wm. Beardmore & Co., Ltd., at Renfrew Aerodrome.

The management offered the pilots a retaining fee of £100 a year and a mileage rate by which a good and hardworking pilot could earn between £700 and £900 per annum. The pilots demanded a guarantee of £450 per annum and pay by time instead of mileage. An agreement was quickly reached on this point, but for weeks afterwards a series of attacks were made by interested parties on Major Woods Humphery, who had been appointed General Manager and Chief Engineer of the new company. Eventually a compromise was reached by the appointment of Major H. G. Brackley, D.S.O., D.S.C., as Air Superintendent, whose chief duty will be to decide whether the weather on any given day is fit for flying or not.

R.A.F. RESERVE SCHOOLS OF INSTRUCTION.

During 1923, the following companies concluded arrangements with the Air Ministry whereby they undertook to operate schools of instruction in connection with the R.A.F. Reserve :—

Wm. Beardmore & Co., Ltd., Dalmuir, Renfrew Aerodrome.

The Bristol Aeroplane Co., Ltd., Filton Aerodrome, Bristol.

The de Havilland Aircraft Co., Ltd., Stag Lane Aerodrome, Egdware.

Armstrong-Whitworth Aircraft, Ltd., Whitley Aerodrome, Coventry.

North Sea Aerial and General Transport Co. (Blackburn Aeroplane and Motor Co., Ltd.), Brough Aerodrome, nr. Hull.

SOME OFFICIAL FIGURES IN CIVIL AVIATION.

[The following figures relating to Civil Aviation in 1923 have been kindly supplied by the Air Ministry.—C. G. G.]

CROSS-CHANNEL AIR TRAFFIC IN 1923.

Total Traffic.

The following table shows the total traffic on the cross-Channel air lines in 1923, as compared with the previous two years :

Air Traffic Between	Great Britain and France.		Great Britain and Holland.*		Great Britain and Belgium.†		Total.	Percentage British.
	British Aircraft.	French Aircraft.	British Aircraft.	Dutch Aircraft.	British Aircraft.	Belgian Aircraft.		
Flights.								
1923	933	1,069	638	556‡	985	391	4,572	56%
1922	2,066	1,463	102	580	717	2	4,930	58.5%
Passengers.								
1923	7,179	2,198	1,736	976	3,022	12	15,123	79%
1922	7,612	2,306	213	562	1,665	1	12,359	77%
Goods, Mail and Newspapers. (tons)								
1923	87.8	398.3	20.0	66.8	218.9	33.8	825.6	39.5%
1922	139.2	235.4	2.2	59.4	41.4	0	477.6	38%

*And Germany, via Holland.
†And Germany, via Belgium.
‡Includes German aircraft from May, 1923.

Passengers.

Out of the total of 15,123 cross-Channel passengers, 9,377 were carried between Great Britain and France, 79% of these on British machines, 3,034 between Great Britain and Belgium or Germany, all but 12 on British machines, and 2,712 between Great Britain and Holland, 64% on British machines.

The record month for passengers was August, 1923, when a total of 2,995 were carried, of whom 2,404 travelled in British machines. The previous best month was August, 1922, with a total of 2,682, of whom 2,203 flew in British machines.

Goods.

As the above table shows, 825.6 tons of goods (including excess luggage and mails) were transported by air between Great Britain and the Continent in 1923, as opposed to 477.6 tons in 1922. Up to December, 1923, British machines had carried 326.7 tons, or 39.5% of the total weight for the year. The large increase in goods traffic in 1923 over 1922 is accounted for largely by the greater quantity of newspapers sent by air. During the period January-October, newspaper traffic amounted to 219.6 tons. Mail matter carried during 1923 totalled 23 tons

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THE BRITISH DOMINIONS BEYOND THE SEAS.

AUSTRALIA.

Aerial Journal :—

Aircraft. Founded : 1920. Published monthly, price 6d., by The Aircraft Press of Australia, Ltd., 350, George Street, Sydney. Editor : J. Hart.

THE ROYAL AUSTRALIAN AIR FORCE.

In 1921 the Air Force was officially designated "The Royal Australian Air Force," and is now commonly known as the "R.A.A.F."

The headquarters and training station of the R.A.A.F. are at Point Cook, Victoria.

R.A.A.F. DIRECTORS.

Chief of the Air Staff : Wing-Commander R. Williams, D.S.O., O.B.E.

Acting Chief of the Air Staff : Wing-Commander S. J. Goble, D.S.O., O.B.E., D.S.C.

Acting Chief of the Administrative Staff : Squadron Leader W. H. Anderson, D.F.C.

Director of Equipment : Squadron Leader P. A. McBain, M.B.E.

CIVIL FLYING OFFICIALS.

Controller of Civil Aviation : Lieut.-Col. Brinsmead.

Superintendent of Aircraft : Capt. F. W. Follett.

Superintendent of Aerodromes : Capt. E. C. Johnson, D.F.C.

Superintendent of Flying Operations : Capt. E. M. Jones, M.C.

THE FLIGHT ROUND AUSTRALIA.

A particularly fine flight was made by Wing-Commander Goble and Flying Officer MacIntyre early in 1924. On a standard Fairey IIID seaplane with a Rolls-Royce "Eagle VIII" engine, they left Melbourne on Feb. 14 and flew completely round Australia, making notes on the way as to the best localities for coast-defence air stations. They arrived back in Melbourne on May 21, having covered 8,000 miles in 90 flying hours. The same engine was used throughout, and when they finished Wing-Commander Goble cabled that the machine was still fit for any service.

TRAINING ACTIVITIES.

Four civilian cadets have graduated for their pilot's wings as the result of their training at No. 1 Station, R.A.A.F. (1923 Course); the results obtained by them in the various subjects in which they were instructed have been communicated to the operating companies, with a view to their employment as pilots when vacancies occur. There appears to be every likelihood of one graduate being engaged by Western Australian Airways, Ltd., in the near future.

Three additional civilian cadet-pupils commenced their training on 29th January, 1924 (1924 Course).

These cadets are nominated in the first instance by the Controller of Civil Aviation and receive pay whilst undergoing training for a period of about twelve months. Their pay, uniform, cost of training, etc., is borne from Royal Australian Air Force Funds.

Qualified pilots who are employed or about to be employed in commercial aviation enterprises are accepted on the recommendation of the Controller of Civil Aviation for short refresher courses of flying instruction at the Flying Training School, Point Cook. No charge is made for this refresher instruction, the cost of which is also borne by Royal Australian Air Force Funds.

THE AUSTRALIAN SUBSIDISED AIR SERVICES.

In the Report of the Australian Air Board issued in August, 1923, the following statistics are given of the two regularly operated subsidised air lines from their date of opening to June 30, 1923.

On the Geraldton-Derby service of the Western Australian Airways which began operations on Dec. 12, 1921, 154,680 miles have been flown covering a period of 1,933 flying hours and 76,290 passenger hours. Approximately 120,000 letters have been carried and a total distance of 2,400 miles covered in each weekly return trip. Six Bristol Tourers (240 h.p. Siddeley "Puma" engine) are used on the service, which receives in subsidy a contract payment of £25,000 per annum.

On the Charleville-Cloncurry service of the Queensland and Northern Territory Aerial Service, which began operations on Nov. 2, 1922, 41,105 miles have been flown, which includes 533 flying hours and 25,045 passenger hours.

AIR MAILS IN AUSTRALIA.—Pilots, Mechanics and Machines (a De Havilland 9c and a Bristol Fighter) of the Charleville-Cloncurry Air Line in Queensland.

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The distance covered in each weekly return trip is 1,160 miles and approximately 9,000 letters have been carried. The company has four machines in use and receives a subsidy of £12,000 per annum.

The following extracts are taken from a Report by the Controller of Civil Aviation, Australia, dated 1st March, 1924 :—

Geraldton—Derby Air Line, Western Australia.

The contract with Western Australian Airways, Ltd., has been again renewed (as from 5th December, 1923). The new contract is for three years and contains provision for the following extensions of the original service :—

(*a*) South—from Geraldton to Perth (250 miles).

(*b*) North-East—from Derby to Wyndham (600 miles).

The extended service from Perth to Derby was inaugurated on 17th January, 1924, and has been maintained to schedule since that date.

The Company's machines now fly 2,684 miles each week, leaving Perth on Thursdays and returning on Tuesdays.

The subsidy payment for the extended service is at the rate of £30,000 annually, but the contract provides for a possible reduction of this amount in the second and third years.

Arrangements are in hand for a further inspection of the country between Derby and Wyndham at the end of the present seasonal rains, when a suitable flying route will be selected; the preparation of necessary landing facilities will then be put in hand with a view to extending the service from Derby to Wyndham as early as possible in the next financial year.

The Company have contracted to provide extra equipment for this extension, in addition to a four-six seater commercial aeroplane for use over the southern sectors of their route.

With the exception of a serious accident at its inception, this service has been carried on successfully, and the facilities it has provided have been readily availed of by the residents. The number of letters carried during the first month the service was in operation was 577; this has now increased to about 15,000 per month.

Charleville—Cloncurry Air Line, Queensland.

This service is operated by the Queensland and Northern Territory Aerial Services, Ltd. The original contract provided for a weekly (return) service for twelve months from 2nd November, 1922, with a subsidy of £12,000. The agreement has now been renewed for a further twelve months from 2nd November, 1923, at the same subsidy rate.

The contractors have obtained two aeroplanes of the De Havilland 9C type, fitted with the well-known Siddeley "Puma" engine (240 h.p.), and providing accommodation in an enclosed cockpit for three passengers. Passenger traffic has increased since the arrival of the 9Cs, and the contractors are now about to order a D.H.50 machine from the same firm.

The service has been maintained successfully and is evidently much appreciated by those residents of Western Queensland who had hitherto to rely on horse or motor conveyance for their transport between the above-named rail heads.

Adelaide—Sydney and Sydney—Brisbane Air Lines.

Owing to various causes, delays have taken place in the commencement of the services, but it is hoped that the aeroplanes ordered by the contractors (The Larkin Aircraft Supply Co., Ltd.) will arrive from England within four months and that very shortly thereafter a through service—weekly in each direction—will be in operation between Adelaide and Brisbane, via Mildura, Hay, Narrandera, Cootamundra, Sydney, Newcastle, Grafton and Ballina.

In the meantime it is probable that the contractors will be permitted to maintain a temporary service (for mails only) between Sydney and Adelaide with their reserve machines. Subject to the satisfactory completion of current negotiations, this interim service should commence operations in March or early April.

FUTURE SERVICES.

Funds allocated for the development of commercial aeroplane services will not permit of the establishment of any additional services during this financial year. Should the Vote in aid of Civil Aviation be increased next year, it will be possible to give careful consideration to four new proposals which have been submitted recently, with a view to recommending at least one service additional to the three already approved.

Briefly, these proposals are as follows :—

(1) *Submitted by H. Davis, Esq., Hon. Sec. Queensland Section, Australian Aero Club, on behalf of a syndicate* :—Twin-engined Flying-boat Service between Townsville and Rabaul.

(2) *Submitted by J. H. Treacy, Esq., Manager of Australian Air Lines and Brokerage Co., Sydney* :—Aeroplane Service between Brisbane and Charleville, linking Brisbane with the Charleville—Cloncurry Service.

(3) *Previously under consideration and re-submitted by H. C. Miller, Esq., Melbourne* :—Flying-boat Service between Adelaide and Port Lincoln (Eyre's Peninsula).

(4) *Previously under consideration and re-submitted by A. G. Simpson, Esq., of Air Transport Limited, Perth* :—Aeroplane Service between Oodnadatta and Alice Springs, South Australia.

PERTH—DERBY AIR LINE STATISTICS.

Period.	Number of Flights. *	Miles Flown. *	Hours Flown. *	Passenger Miles Flown. †	Passengers Carried Over Single Stages.†	Letters Carried.	Goods Carried lbs.	Remarks.
5/12/21 to 4/12/1923 (2 years)	1,275	226,497	2,871	160,850	845	188,344	7,852	*Includes ferrying flights over route
Month of December, 1923	54	9,085	116	8,028	49	15,335	422	†Includes non-paying passengers, such as mechanics, spare pilots, etc.
Month of January, 1924	67	12,499	164	9,285	51	Not yet available.	369	
TOTAL, 5/12/21 to 31/1/1924	1,396	248,081	3,151	178,163	945	203,679‡	8,643	

‡From 5/12/21 to 31/12/23 only.

PERTH—DERBY AIR LINE.

Contractors : Western Australian Airways, Ltd., Perth, W.A.

Original Agreement : Service between Geraldton and Derby, W.A., for twelve months from Dec. 5, 1921.

Renewals of Agreement (with Variations in Conditions) :

(*a*) Twelve months from Dec. 5, 1922.

(*b*) Three years from Dec. 5, 1923, with provision for two extensions—South from Geraldton to Perth, and North-East from Derby to Wyndham.

The extension to Perth was commenced on Jan. 17, 1924.

The Derby—Wyndham extension will not operate until after a suitable route is surveyed and adequate landing facilities provided.

Route : Perth to Derby, via Geraldton, Carnarvon, Onslow, Roebourne, Port Hedland and Broome.

Frequency of Service : Once weekly in each direction.

Leave Perth, Thursday; Arrive Derby, Saturday.

Leave Derby, Saturday; Arrive Perth, Tuesday.

Length of Route : 1,442 miles (Perth—Derby). Prior to Jan. 17, 1924, the route was 1,200 miles) (Geraldton—Derby).

Pilots employed : 5.

Machines Provided under Contract : 6 Bristol Tourers, 240 h.p. Siddeley "Puma" engines.

Landing Grounds Provided : Regular stopping places, 8; emergency landing grounds, 7. Occasional landings are made at several station homesteads where private landing grounds are available.

Annual Payment for Maintenance of Service in accordance with Contract Conditions : £30,000. (Prior to Jan. 17, 1924, the payment was £25,000 for service between Geraldton and Derby).

Deductions for Uncompleted Journeys :

(*a*) At the rate of 2/- for each mile not flown during the continuance of officially certified "storm-warning" conditions;

(*b*) At the rate of 4/- for each mile not flown for any other reason.

Postage Rates for Mails Conveyed by Air : 3d. per ½ oz., in addition to the ordinary postage rates.

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BRITISH EMPIRE.—*continued.*

CHARLEVILLE—CLONCURRY AIR LINE STATISTICS.

Period.	Number of Flights. *	Miles Flown. *	Hours Flown. *	Passenger Miles Flown. †	Passengers Carried Over Single Stages.†	Letters Carried.	Goods Carried lbs.	Remarks.
			Hrs. Mins.					
2/11/22 to 1/11/23 (1 year)	652	61,075	839 10	34,036	341	12,985	3,684¾	*Includes ferrying flights over route
Month of November, 1923	55	5,193	63 40	5,118	55	1,051	555	
Month of December, 1923	55	5,193	64 30	6,770	73	1,041	283½	†Includes non-paying passengers, such as mechanics, spare pilots, etc.
Month of January, 1924	51	4,882	63 55	6,343	65	Not available	409¼	
TOTAL, 2/11/22 to 31/1/24	813	76,343	1031 15	52,267	534	15,077‡	4,932½	

‡From 2/11/22 to 31/12/23 only.

CHARLEVILLE-CLONCURRY AIR LINE.

Contractors: The Queensland and Northern Territory Aerial Services, Ltd., Longreach, Queensland.

Original Agreement: Service between Charleville and Cloncurry, Queensland, for twelve months from Nov. 2, 1922.

Renewals of Agreement (with Minor Variations in Conditions): (*a*) Twelve months from Nov. 2, 1923.

Route: Charleville to Cloncurry, via Tambo, Blackall, Longreach, Winton and Mackinlay.

Frequency of Service: Once weekly in each direction.
Leave Charleville, Thursday; arrive Cloncurry, Friday.
Leave Cloncurry, Sunday: arrive Charleville, Monday.

Length of Route: 577 miles.

Pilots Employed: 2.

Machines Provided under Contract: 2 D.H.c's, 240 h.p. "Puma" engines; 1 D.H.4 (Modified), 375 h.p. "Eagle VIII" engine; 1 Bristol Fighter, 240 h.p. "Puma" engine.

Landing Grounds provided: Regular stopping places, 7; emergency landing grounds, 2. (Numerous private landing grounds available at station homesteads adjoining route.)

Annual Payment for Maintenance of Service in Accordance with Contract Conditions: £12,000.

Deductions for Uncompleted Journeys: At the rate of 4/- for each mile not flown.

Postage Rates for Mails Conveyed by Air: 3d. per ½ oz. in addition to the ordinary postage rates.

Flying in Northern Australia.

In Feb., 1921, the Queensland and Northern Territory Aerial Services, Ltd., which for convenience sake is abbreviated to Qantas, began operations over the service Charleville—Tambo—Blackall—Longreach—Winton—McKinlay—Cloncurry.

The distance between Charleville and Cloncurry is about 600 miles and the air service connects the railheads of the railway systems which run westward from the coast. Formerly the journey in the dry season occupied many days, and in the winter it was frequently impassable. With the air service the time taken is about 8 hours, no matter what season.

In Nov., 1922, they started carrying Mail, subsidised by the Government to the extent of £12,000 per annum.

Owing to the scarcity of machines in Australia, the Company brought into use a varied collection of aircraft, and with these, a Bristol Fighter (300 h.p. Hispano-Suiza), a D.H.4 (375 h.p. Rolls-Royce), two Armstrong-Whitworth F.K.8s (160 h.p. Beardmores), and an Avro 504K (100 h.p. Sunbeam-Dyak), their work has been excellent. Now that the Company is established, an effort is being made to standardise equipment and three D.H.9c's (230 h.p. Siddeley "Pumas") are on their way out to Australia, where it is hoped that they will prove as successful as have similar machines in this country.

The pilots are Mr. F. W. Haig (late No. 1 Sqdn.) and Capt. G. C. Matthews (late No. 4 Sqdn.) and Mr. Hudson Fysh, who is manager and also acts as a pilot.

Since the opening in Feb., 1921 to June, 1923, the Company have flown 93,440 miles and 1,449 hours, made 1,737 flights and carried 1,260 passengers, not including 150 passengers carried on pleasure trips and taxi work.

Since the first grant of a mail subsidy on Nov. 2, 1922, they have carried 213 passengers, 210 parcels, 2,449 lbs. of newspapers, 800 lbs. of freight, 760 lbs. of luggage, 8,800 letters, and of the 138 scheduled flights 137 have been complete, showing an efficiency of 99.3 per cent.

Although these mail figures appear to be small, it must be realised that the towns served are small and that most of the mail carried is urgent. When operations were started, people did not care to travel by air, but since the above results have been established there is usually at least one passenger carried on each trip on the regular service.

So far, since the opening of the route in 1921, there have been six accidents causing damage to machines, but since Nov., 1922, they have had only four forced landings, none of which caused any damage whatsoever, and during the whole period there has been no injury to personnel or passengers. This is a wonderful record for a young company operating over wild and unpopulated country with aged and unsuitable equipment.

Air Companies:—

Australian Aerial Mail Services, Ltd. Date of Incorp.: March, 1922. Offices: Sydney, N.S.W. Director: Capt. H. J. Larkin. This Company was formed to amalgamate the Air Line interests of the Larkin Aircraft Supply Co., Ltd., and of Mr. F. L. Roberts, each of whom had been awarded contracts by the Commonwealth Government for the Sydney—Brisbane—Adelaide and the Sydney—Melbourne passenger and mail services. Though it has existed for more than two years, it has not yet begun operations.

Queensland and Northern Territory Aerial Services, Ltd. Offices: Charleville, Queensland. Services operated: Cloncurry—Charleville.

West Australian Airways, Ltd. Offices: Geraldton, Western Australia. Director: Major N. Brearley. Services operated: Derby—Geraldton.

BURMA.

THE IRRAWADDY SURVEY.

The only bright spot in aviation, so far as it comes within the purview of the Indian Government, has been the survey of the Irrawaddy Delta, which is in Burma.

The Irrawaddy survey was first considered officially in January, 1922, but the Government of Burma had been considering the subject unofficially for some time before. A provisional quotation from the survey of the Delta had been received, but this did not include local transport base charges or housing, and these in themselves looked like doubling the cost. By August, 1922, when a meeting was held to consider the subject there were no firms actually ready to undertake the work. At any rate there were no British firms equipped to do so.

The Bermuda and West Atlantic Aviation Company, which had undertaken a survey of the Orinoco Delta, had suspended operations at that time and the Aircraft Operating Company had not been formed. The Aerial Survey Company (Newfoundland) Ltd. were busy on their own affairs and there was no firm in England actually organised for survey work. The British Air Ministry was not prepared to undertake the operations, as they held very rightly to the policy of allowing commercially organised companies to do all that there was to be done.

Ultimately the Burmese authorities approached Mr. Ronald Kemp, who will be remembered as one of the pioneers of English aviation. He was at that time and still is Consulting Aeronautical Engineer to the Government of India. Mr. Kemp, who had previously discussed the survey with the Burmese authorities thereupon submitted a scheme whereby the Forest Department of Burma should do the work themselves, under his direction. The arrangement was that the Forest Department was to engage

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BRITISH EMPIRE—*continued.*

the necessary skilled personnel and to acquire the necessary material. This scheme was provisionally accepted and was passed through in the Budget for 1923.

Thereafter, when the scheme came before the Finance Committee of the Burmese Government it was considered too experimental to be undertaken in the manner suggested. Consequently, though the Committee were in favour of it on general principles, they decided to sanction the expenditure only in the form of a definite contract. Mr. Kemp was asked whether he would himself undertake to do the work as a direct job, and after due consideration and after obtaining leave from the Government of India he decided to do so.

The actual contract was not settled until the last week in July, 1923. But by good fortune most of the arrangements on the technical side had already been settled and it was just possible to get the work going in the following season. Ultimately the whole survey has been signally successful, in spite of all difficulties, and in spite of the distinctly hurried preparations at the last moment.

How the Work was Done.

The first actual contract was for the survey of an area of 1,050 square miles. This included not only the survey of the waterways of the Delta, which as the photographs show are distinctly complicated, but also several valuable forest reserves. The results of the first surveys were so gratifying and the photographs showed such a high degree of accuracy and wealth of detail that the Government of Burma decided to extend the contract by including another area of about 350 square miles which embraced an adjoining forest reserve.

All the photographs and mapping of this 1,400 square miles had been completed by the end of March, 1924, and since then the air surveyors have been engaged in mapping Rangoon itself.

The whole of the operations were under Mr. Ronald Kemp as general manager and pilot. With him, in charge of all the flying arrangements, was Major C. K. Cochran-Patrick, D.S.O., M.C., who is associated with the Aircraft Operating Company.

Major Patrick had had previous experience of survey work of a somewhat similar nature in the ill-fated attempt to survey the Orinoco Delta. No experience in this life is ever wasted if it be properly appreciated, and Major Patrick's South American experience turned out to be most useful in Burma. One is informed by an entirely unprejudiced observer that Major Patrick proved to be an extraordinarily steady pilot and put in 5 to 6½ hours in the air daily for days at a time. The success of the Irrawaddy survey is very largely due to his organising ability and his capacity for hard work.

The actual photographic work was mostly done by Flg. Off. J. Durward, who was lent by the R.A.F. India. He had previously done a very large amount of good work in Iraq, where he was responsible for quite a large proportion of the air mapping which was done there. Naturally his experience of taking photographs and working photographic apparatus in the hot climate of the Orient were invaluable in Burma.

Under Mr. Durward there were one European and nine Indians who operated in two darkrooms, a washing and drying room, and map room and a camera repair shop. Up to the end of March they had produced nearly 4,000 negatives and three times that number of prints.

Mr. H. K. Armstrong, who was in charge of the advanced base, has had both photographic experience as a photographer in the Navy and aircraft experience at the Armstrong-Whitworth works at Newcastle. The three chief mechanics of the undertaking were Messrs. Bishop, Anderson and Parker. Messrs. Bishop and Parker are the passengers seen in the photograph of No. 1 machine, which is piloted by Mr. Kemp.

In addition there were three skilled European mechanics, one storekeeper and eight skilled native hands, besides unskilled labour as might be required.

The photographs were taken at a height of 9,500 feet with a camera having a focal length of 6 inches, which gives a scale of about 3½ inches to the mile. These photographs, when adjusted to scale and built into a mosaic, were handed over to Major Lewis, R.E., of the Government Survey of India, who is undertaking the completion of the maps.

Colonel C. P. Gunter, R.E., and Major Lewis, who were in charge of the survey on behalf of the Burmese Government, were responsible for all the mapping work in Mesopotamia during the War, 1914-18. In the Irrawaddy Survey, Major Lewis undertook the difficult work of fixing points around the coast and up the main rivers and creeks in the Delta, these points being used for the base lines to which the photographic work was tied.

CANADA.

The Canadian Air Board, which was formed early in 1920, has now been absorbed by the Ministry of National Defence, and on January 1st, 1923, the Royal Canadian Air Force was formed as a permanent force. The chief officials are as follows :—

Acting Director of the R.C.A.F. and Assistant Director of Organisation, Training and Operations : Wing-Commander J. L. Gordon, D.F.C.

Assistant Director of Technical Supply and Transport : Wing-Commander E. W. Stedman.

Assistant Director and Secretary : Mr. J. A. Wilson.

Controller of Civil Aviation : Sqdn Ldr. L. S. Breadner, D.S.C.

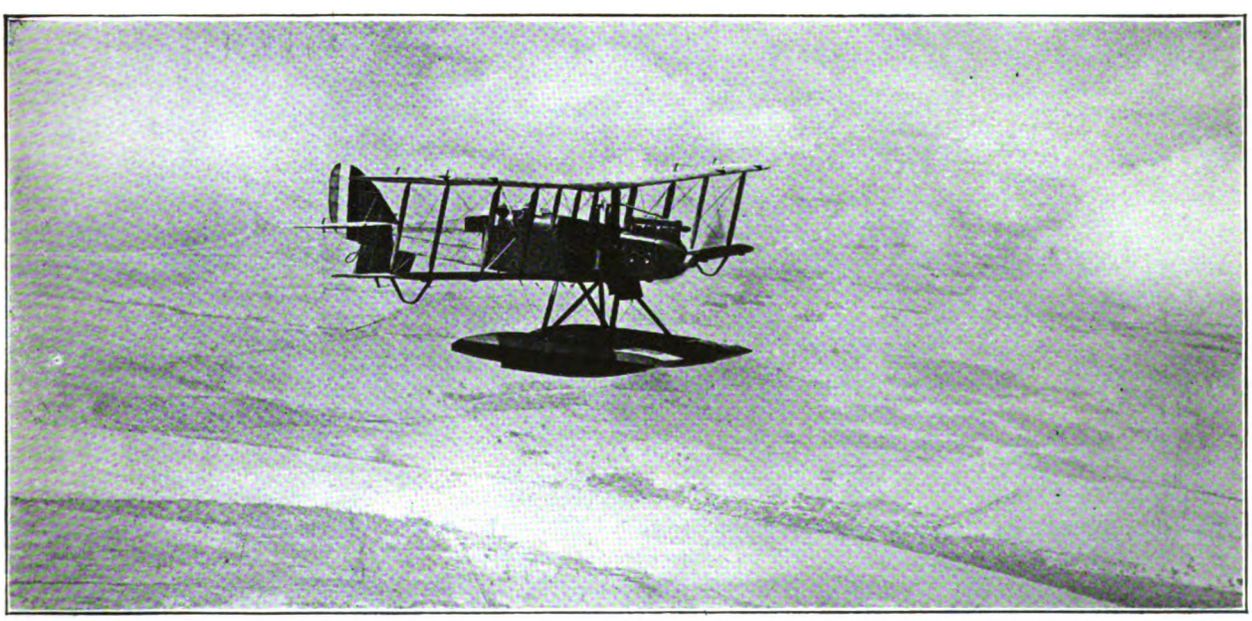
Camp Borden :—Officer Commanding : Wing-Commander W. G. Barker, V.C., D.S.O., M.C.

The four permanent stations of the Royal Canadian Air Force are :—

1. Vancouver, B.C.
2. Winnipeg, Man.
3. Camp Borden, P.Q.
4. Dartmouth, N.S.

Of the permanent stations, Camp Borden is the training centre and headquarters of the R.C.A.F., the other stations being used for Government survey work, forest patrols, customs patrols, prevention of drug smuggling, etc.

At the beginning of 1922, the following machines were at Camp Borden :—49 Avro 504K, 10 Curtiss J.N.4, 10 S.E.5a,



FLYING IN BURMA.—A D.H.9 (Siddeley Puma Engine) flying on the Irrawaddy Survey.

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FLYING IN CANADA.—A flying-boat of the Fairchild Aerial Survey Company.

6 D.H.9a, 2 Snipe and 2 Bristol Fighters. Apparently the same old machines were still in use in 1924.

F.3 and H.16 flying-boats are used for the sea, lake and river work, but these machines have now been superseded by the Vickers "Viking Mark IV," of which eight have been ordered, two built in England and the other six to be constructed at the Vickers Works, Montreal.

CIVIL AIRCRAFT IN CANADA.

As there is some confusion concerning the operation of civil aircraft firms in Canada, the following notes by a correspondent on the spot will be found of interest.:—

The situation in Canada is this. The Aerial Survey Co., Ltd., of Newfoundland, I understand, has closed up its operations.

The Fairchild Aerial Surveys Co., of Canada, has Mr. Elwood Wilson, Chief Forester of the Laurentide Company, as its Managing Director. This is a Canadian company, but part of the stock is owned by the Fairchild Aerial Camera Corporation, of New York, which company was formed first and builds cameras and does aerial survey work. This is the biggest and most important aerial camera company in the United States. The Fairchild Aerial Surveys Co. was formed in 1922 and confines itself to aerial photographic work. Mr. Sherman M. Fairchild is President of both companies. He is a young man who is very much interested in aeronautics, and is the inventor of the Fairchild aerial camera.

The Laurentide Air Service is a company which was formed by an ex-pilot of the Laurentide Company. The Laurentide Company is a paper and pulp manufacturing company, of which Mr. Wilson is the Chief Forester. In 1919 he got two H.S.2L.S. from the Dominion Government and used them for fire patrol and aerial mapping. He continued this work in 1920 and 1921. In 1922 one of the pilots asked if he could lease the air station and do the firm's work and what outside work he could get. To this the firm consented. He formed the Laurentide Air Service, of which Mr. Wilson is also a Director.

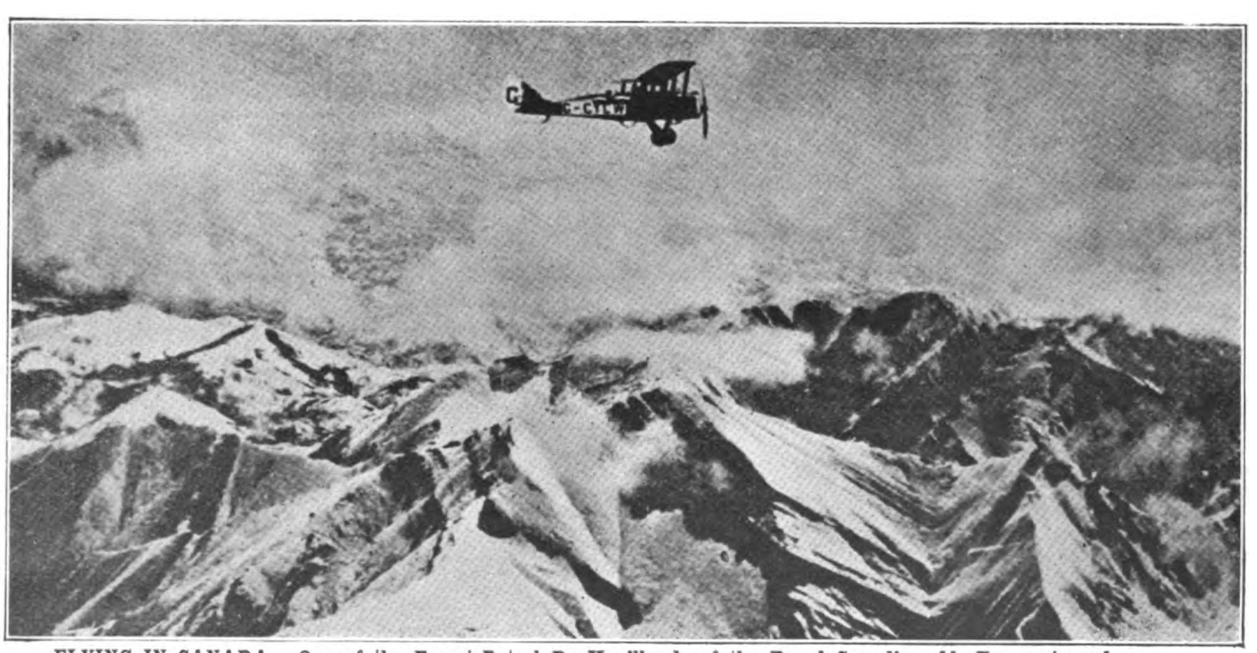
There was a contract between the Laurentide Air Service and the Fairchild Aerial Surveys Co., by which the former did all the flying for the latter, and the latter all the photography for the former. This worked out very satisfactorily in 1922, but this year the Laurentide Air Service had a large contract for the Ontario Government, and as they had not quite enough machines they refused to carry out their contract for the Fairchild Aerial Surveys Co., which made it very difficult for that company. It became necessary to buy an aeroplane, and so the Fairchild Company are now doing their own flying under the direction of Captain K. F. Saunders, who is the head of the Flying Department. The Fairchild Company had contracts in 1923 for surveying 643 square miles.

The Fairchild Co. do timber estimating, mapping, water power surveys, etc. The Laurentide Air Service does transportation, taxi work and fire patrol for the Ontario Government.

The Fairchild Co. are continually adding to their staff and equipment in order to cope with their continually enlarging sphere of action. They have recently acquired the services of Mr. Gerard H. Matthes, a well-known Amercian civil engineer who has done a great deal of mapping work by aeroplane.

In flying equipment they have made a contract with the Huff-Daland Co., of Ogdensburg, N.Y., for a Huff-Daland "Petrel" to be fitted with interchangeable wheels, floats or ski and a Curtiss C.6 engine.

In aerial photography they made in 1924 a contract with the Canadian Pacific Railway Co. to map 475 square miles of territory and to do 65 miles of railway location, and their most recent contract is with the Wayagamack Pulp and Paper Co. for 2,500 square miles of timber surveys.



FLYING IN CANADA.—One of the Forest-Patrol De Havillands of the Royal Canadian Air Force at work.

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BRITISH EMPIRE—*continued.*

CANADA AND FOREST PATROL.

On Jan. 7-11 an important conference of Canadian federal and provincial forest officers was held in the Ottawa House of Commons when the vital question of forest fire protection was discussed in all its bearings.

In the full report of the conference first issued the following resolution, numbered 10, is of interest :—

"Whereas in many parts of Canada the use of aircraft offers the only possible solution of the problem of forest fire protection, and whereas the expenditure involved is beyond the financial means of forest authorities, Resolved that this Conference recommends that the Dominion Government should provide substantial assistance to the provinces either by donation of air service facilities or by subsidies to the provincial forest authorities sufficient to allow them to obtain service from commercial aircraft companies."

The Hon. S. W. Lyons, Minister of Lands and Forests of the Ontario Government, make the following statement to His Majesty's Trade Commissioner at Toronto :—

"Guided by the experience of the last few months of 1923, having due regard for the work accomplished and the expense entailed, the Government has decided to purchase, and have purchased, 13 seaplanes of Class "A" H.S.2L. type, to be put into service on 1st May, 1924, with a view to giving greater protection to the vast forest areas, and with the hope that renewed confidence may be established in the minds of those investing large sums of capital in the organisation and operation of our pulp and paper and saw mills.

"Heretofore, although the expenditures have reached the amount stated above, only a small portion of the northern area of forest land was properly patrolled, and it is the intention, with the adoption of aircraft, to divide the northern forest into districts, and to establish in each district a base for aircraft operations, so that in a general way the entire forest area of Northern Ontario may have a daily patrol.

"It is the intention of the Government to make a general survey of the forest wealth of Northern Ontario so as to be able to determine the amount of timber still available, and to determine the amount of reforestration, if any, is necessary to replace, along with the growth, the consumption of our large industries, and to determine if the Province is now getting sufficient for its timber.

"As there will be times during the season when on account of heavy rains and other conditions, the entire aircraft will not be required for daily use, the Government proposes to use the machines during the spare time to make a general preliminary survey, thus eliminating the cost of otherwise carrying out this work.

"It is expected that in addition to giving a patrol service and protection to several times the area now patrolled, the Province will save from the use of aircraft at least £250,000 per year."

AERIAL MAPPING IN CANADA.

During the season just closed, a number of experiments have been carried out in the use of aircraft for supplementing the work of parties employed by the Topographical Survey in Western and North-Western Canada. These experiments were conducted by the Royal Canadian Air Force, under the direction of Mr. A. M. Narraway, Controller of Surveys, and consisted of taking a series of vertical and oblique photographs from aircraft flying at pre-determined heights. The photographs were used as an aid in plotting topographical features on the map.

Operations were first conducted in the area north of Pas, Manitoba, where reliable maps are required to facilitate the development of the mineral and forest resources in which the district is known to abound, and where, owing to the nature of the country, ordinary survey methods have been hitherto restricted to the limits of the main connected waterways.

After a land survey party had been sent into this area in the spring, a seaplane manned by the pilot, an engineer and a photographer, followed later in the season.

The seaplane following the course made by the land party took oblique photographs from a constant height of 4,000 feet at intervals of every three miles, so that each picture showed in the foreground the terrain shown in the background of the previous one. In addition to these photographs, which were taken directly ahead, a further series were taken in a systematic manner at right angles to the line of flight. By this means photographs were obtained of a strip of country stretching for over five miles on each side of the line.

When the photographs were developed they were divided up by a grid system and the mass of topographical features revealed by the photographs was plotted on the bare plans prepared by the ground survey.

Upwards of 700 photographs were obtained, and these are now being plotted on the maps, which when completed will be the most complete ever issued of any district in the north of Canada.

The next series of experiments was carried out in the settled areas in the vicinity of Red Deer and Edmonton, Alberta. A further series of experiments was carried out in the Edmonton district in conjunction with the surveys for the classification of lands for settlement. This work requires the use of accurate maps showing the roads and trails areas covered by bush, swamps, hay meadows, and other natural features.

These experiments indicate great possibilities and the results show that it is possible to go into an area previously unmapped and by means of aerial photography and a comparatively small amount of ground work to map even the most intricate waterways.

LIST OF CANADIAN LICENSED AIRHARBOURS.

(Corrected to December 31st, 1923.)

Location.	Type.
Regina, Sask. S.W. of City, near Parliament Buildings.	Commercial, over 800 yds.
Saskatoon, Sask. 2 miles N.W. of P. Office.	Commercial, 300 × 400 yds.
Edmonton, Alberta. St. Albert Trail. 3½ miles N.W. of Post Office.	Commercial, under 300 yds.
Hanna, Alberta. ¾ mile S.E. of Town.	Commercial, under 300 yds.
Montreal, P.Q. Approximately 7 miles N. of City, near Town of St. Laurent.	Customs airharbour, 750 yds. N. & S. by 400 yds. E. & W.
Toronto, Ont. About 1½ miles N.W. of Stop 26, Metropolitan Railway, York Township.	Customs airharbour, 400 yds. in circular diameter.
Winnipeg, Man. River Park, Western edge of City.	Commercial, under 300 yds.
Winnipeg, Man. 5 miles in a Westerly direction from corner Portage Ave. and Main Street.	Commercial, 500 × 300 yds.
Grand Mere, P.Q. ¼ mile E. of Lac a la Tortue and 3 miles S.E. of Town.	Commercial seaplane station, over 800 yds.
Virden, Man. About 1½ miles S. of Town.	Customs airharbour, 800 yds. N. & S. × 800 yds. E. & W.
Sault Ste. Marie, Ont. At. Mary's River, near Imperial Oil Co's. Dock.	Commercial seaplane station, over 800 yds.
Brandon, Man. ½ mile W. of City on Victoria Ave.	Commercial, 400 × 600 yds.
Comox, B.C. ½ mile S.W. of Town.	Commercial seaplane station, over 800 yds.
Camp Borden, Ont. 4 miles S.W. of Angus, Ont., and 15 miles S.W. of Barrie, Ont.	Government air station, 1 mile × 2 miles.
Roberval, P.Q. North end of Town.	Government seaplane station, over 800 yds.
Chicoutimi, P.Q. On Saguenay River, W. of Town.	Commercial seaplane station, over 800 yds.
Ottawa, Ontario. On right bank of Ottawa River, east of Rockliffe Rifle Range butts, opposite centre of Kettle Island.	Government aeroplane and seaplane station, 700 × 400 yds.
Vancouver, B.C. Jericho Beach.	Government seaplane station, over 4 miles square.
Deseronto, Ont. About 3½ miles W. of Town.	Customs airharbour, 440 yds. N. & S. × 800 yds. E. & W.
Yorkton, Sask. On North half of Section 18, Township 26, Range 3, W. of the 2nd Meridian.	Commercial airharbour, under 300 yds.
Lethbridge, Alberta. Exhibition Grounds, 2 miles W. of City.	Commercial airharbour, 600 × 800 yds.
Fredericton, N.B. On St. John River, on W. side of Highway Bridge.	Customs airharbour (seaplane), over 800 yds. N. & S., over 800 yds. E. & W.
Dartmouth, N.S. 4 miles S.E. of City, opposite North end of McNab Island.	Government seaplane station, over 800 yds.

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BRITISH EMPIRE—*continued.*

Hampstead (Near Montreal, P.Q.). ½ mile N. of Hampstead, P.Q., Mount Royal, 2 miles S.E. Blue Bonnet Race Track, ½ mile N.	Commercial, under 300 yds.
High River, Alta. 2½ miles N.E. of Town.	Government air station, 600 × 800 yds.
Moose Jaw, Sask. Lynbrook Heights, addition to City.	Customs airharbour, 400 yds. N. & S., 700 yds. E. & W.
Calgary, Alberta. 6 miles W.	Commercial, 300 yds. square.
Vancouver Harbour, B.C. At foot of Burrard St., on Burrard Inlet.	Commercial seaplane station, approximately 2 square miles.
Lake Minnawacka (Near Banff, Alberta). 7 miles N.N.W. and 3 miles W. of Bankhead.	Commercial seaplane station, 1000 yds. × 5 miles.
Toronto, Ontario. N.E. edge of City, 6 miles N. of Lake Ontario.	Customs airharbour, 400 × 700 yds.
Victoria Beach, Man. Victoria Beach.	Government air station, over 800 yds.
Saskatoon, Sask. S.W. ¼ Section 8, Township 37, Range 5, W. of 3rd Meridian, 3 miles N.W. of City Hall.	Commercial, 400 × 600 yds.
Hazleton, B.C.	Private and commercial, 200 × 600 yds.
Wapella, Sask.	Private and commercial, 300 × 300 yds.
Brantford, Ont.	Private and commercial, 300 × 400 yds.
St. Jovite, Que.	Private and commercial, 300 × 550 yds.
Esquimault, B.C.	Private and commercial, over 800 yds. square.
Halifax, N.S.	Government seaplane station, over 800 yds. square

INDIA.

Nearly all the flying in India has been done by the Royal Air Force, which has been continually engaged in warfare with the Afghan tribes of the North-West Frontier. Despite starvation of matériel by the India Government, much good work has been done, and the cost of many primitive expeditions has been saved by a few old and ill-conditioned aeroplanes handled in a masterly manner by the R.A.F.

Owing to lack of funds, little or no development has taken place during 1923. The small amount of money available has been insufficient for the construction of aerodromes and landing grounds on any inland routes.

A Capt. Murphy, who was operating at Karachi in 1922, prepared schemes for the operation of a service between Karachi and Bombay, but the proposition was impracticable without considerable financial backing from the Government. He had also under investigation proposals for services between Bombay and Kathiawar, and Lahore and Shrinagar, and also a flying school at Bombay. Nothing so far has developed from his schemes.

It is understood that there is still some flying done by the Bharatpur State Flying Corps.

From the Dum-Dum Aerodrome, Calcutta, some amount of flying was done in 1922-23 by Col. Villiers and others on Col. Villiers' Avro "Baby" and Sopwith "Pup." Major Wates also flew there on a gift Avro 504K.

The gift aeroplanes remaining from those presented to the R.A.F. in India and those reserved for political purpose, have been returned to the Public Works Department, Aviation Branch, and are being given away to individuals who are attempting to introduce commercial aviation in India. All restrictions as to sale, etc., previously imposed, have now been removed.

Of the 82 aeroplanes presented to the R.A.F., individuals and firms, 41 only were known to be in serviceable condition at the beginning of 1923, and nothing was known as to the condition of 18 machines presented to Indian States.

IRISH FREE STATE.

The Irish Free State has a few aeroplanes supplied by the Aircraft Disposal Co., Ltd., and it has taken over the aerodromes and repair shops formerly used by the Royal Air Force. A young man named Kelly, formerly a junior officer in the Royal Air Force, is in command of the Irish Free State aircraft.

NEWFOUNDLAND.

The Aerial Survey Co. (Newfoundland), Ltd., 166, Duckworth Street, St. Johns, Newfoundland, have been working in Newfoundland and Labrador since late 1920, when Capt. Sydney Cotton (late R.A.F.) took out a Westland "Limousine" (Napier "Lion") and a D.H.9 (Siddeley "Puma"), which he used to good effect at seal spotting.

In late 1921 he took out a Martinsyde "A" biplane (Rolls Royce "Falcon") and in 1922 a further Martinsyde, of the same type, was dispatched to him.

In 1922, the Avro "Antarctic Baby" seaplane, which had been specially built for the Shackleton-Rowett Expedition, was purchased for use in Newfoundland.

With the above equipment, the Aerial Survey Co. carried out extensive flying, both in Summer and Winter. Bases were established at St. Johns, Botwood, Hawkes Bay, St. Anthony, in Newfoundland, and at Battle Harbour, N. W. River, Cartwright and Rigolet, in the Labrador.

The Aerial Survey Co. have done seal spotting, mail-carrying for the Newfoundland Government, aerial surveys of timber areas, photographic surveys and carrying newspapers and passengers to distant points, many of which are cut off from the outside world from November to June.

So far as can be learned, the firm's activities ceased in 1923, owing to lack of support, and the machines have since been laid up in store.

NEW ZEALAND.

Mr. Henry F. Wigram, Chairman of the Canterbury N.Z. Aviation Co., Ltd., writing in 1922, said :—

New Zealand has no reason to be proud of her official record in the matter of Aviation since the termination of the War. Of all the young New Zealanders who qualified as Air Pilots or Mechanics a bare handful continued in training, and those, for the most part, with private companies. The splendid opportunity of establishing an Air Force for Defence purposes was entirely neglected.

The Imperial Government's free offer of a hundred of the most modern machines was simply declined. Young men who had become expert and who had distinguished themselves during the War were given not the slightest encouragement to continue in training ; and no provision was made for the training of recruits.

So long as the War lasted, the Government claimed that it had too much other work on its hands to permit it to give any attention to Aviation, and it was left to private enterprise to assist the British Government by training airmen for service in the Great War.

Private enterprise, represented by Messrs. Walsh Bros., in Auckland, and by the Canterbury Aviation Company, in Christchurch, undertook the preliminary training of pilots, under a scheme that had the endorsement of the Defence Department.

The undertakings were rendered possible only by the support of patriotic citizens, who had no other idea than that of helping their country at a critical period in her history. The value of the work done may be judged from the number of pilots gaining the Royal Aero Club's Certificate, my own Company at Sockburn having put through 170 qualified men by the date of the Armistice.

In November, 1919, Capt. Euan Dickson, D.S.C., D.F.C., C. de G., arrived in Christchurch to take the place of the late Mr. C. M. Hill, the Canterbury Aviation Company's Chief Instructor, who had lost his life in a flying accident on February 1st of that year.

Soon after his arrival, the General Election took place, and the Reform Party under Mr. Massey was returned by an enormous majority. Sir James Allen was appointed High Commissioner, and resigned his seat about the end of March, 1920, the Hon. J. G. Coates being appointed acting Minister of Defence for the time being.

Captain Dickson's services were made use of by the Government in plotting out air routes and emergency landing places throughout the South Island. Capt. Dickson's services were also made use of in supplying estimates of the cost of training pilots, and of running mail services.

A second offer of aeroplanes made by the British Government, probably early in 1920, seems to have been accepted. There were about 30 machines, Avros and D.H.9's.

About the middle of July, 1920, the Government set up an Air Board, under the Presidency of Major-General Sir E. W. Chaytor. He was supported by one military officer, Brigadier-General Richardson, and by Commander Williams, R.N., the remainder of the Board being civilians, representing the following Departments :—Land and Survey, Public Works (two representatives) and Postal (two representatives). Col. Sleeman was appointed Secretary.

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BRITISH EMPIRE—*continued.*

It will be seen that no aviators were included in the personnel of the Board, and also that the representatives of Civil Aviation predominated. The policy of the Government seems to have been to cast the burden of aviation on the Civil Departments, and on private enterprise, rather than on the Defence Department.

On July 21st, a few days after the constitution of the Air Board, Sir Heaton Rhodes succeeded Mr. Coates as Minister of Defence.

It was at this time that the Government adopted a policy which ultimately spelt disaster to private aviation in New Zealand. It lent five aeroplanes, worth approximately £5,000, to a syndicate just established in Timaru, and the bulk of the remainder to the two existing companies on the same terms, i.e., rent free. The result was as might have been anticipated. The new syndicate (it was not formed into a company until a year later) supplied with new machines which cost it nothing, started to compete in both islands with the existing companies.

Prior to the advent of the Timaru Syndicate, Messrs. Walsh Bros. and the Canterbury Aviation Co. were far enough apart to avoid competition, they operated in the North Island and we in the South. It could not be said that either company was misusing its monopoly, for neither had paid a dividend, and our directors had given their services free.

AERIAL WORK.

With the exception of some experimental mail services carried on by Messrs. Walsh Bros. in the north, and a similar service between Christchurch and Timaru, by the Canterbury Company during February and March, 1921, there has been no useful air work accomplished in New Zealand since the War, and the Home Government's gift machines have been used by the companies for joy-rides and exhibitions.

By the early part of last winter (1922) it had become manifest that all three companies were losing money rapidly, and Mr. Wigley, Chairman of the N.Z. Aero Transport Co., Ltd., Timaru, appealed to the Defence Minister to call a conference of the three companies to consider what could be done. Sir Heaton agreed. He advocated an amalgamation of the three companies, and at his request we sent a representative. The conference was held on 13th June, 1922, and proved abortive, owing to Sir Heaton being unable to make any definite statement of the position the Government would take up.

A second conference was held on September 15th, but with no practical result as far as amalgamation was concerned.

In conclusion, Mr. Wigram points out that no provision was made in the New Zealand Government's Estimates in 1921-22-23, beyond a total of £9,036, chiefly devoted to the expenses of the Air Board. Mr. Wigram suggests that the well-known patriot, Mr. Massey, as Finance Minister, is responsible for preventing expenditure on aviation.

THE NEW ZEALAND AIR FORCE.

So far as can be discovered, the only aviation activity in New Zealand in 1923 was the formation of an aeroplane unit of the Territorial Force, which was to be designated "The New Zealand Air Force" and was to have Headquarters at Wellington.

The New Zealand Official Gazette noted the appointment as from June 14, 1923, of Major Keith L. Caldwell, M.C., D.F.C., to command the N.Z.A.F., and under him were appointed, also from that date, 14 captains, 27 lieutenants and 29 second-lieutenants.

No news has reached this country of any flying, and one has not heard of any new machines having been bought in England for the N.Z.A.F., so presumably any flying that has been done has been on the old "gift" machines.

SOUTH AFRICA.

THE SOUTH AFRICAN CIVIL AIR BOARD.

The following information concerning the appointment of a Civil Air Board is based on a notice that appeared in the S.A. Union Government "Gazette" for Aug. 17, 1923.

Under the Aviation Act, 16 of 1923, the Governor-General has appointed a Civil Air Board to hold office for three years, consisting of: Major E. A. Sturman, C.B.E., Postmaster-General; Brig.-Gen. A. J. E. Brink, D.S.O., Chief of the General Staff and Secretary for Defence; Dr. W. E. Bok, Secretary for Justice; G. O. Smith, I.S.O., Commissioner of Customs and Excise; Lt.-Col. F. R. Collins, D.S.O., Chief Mechanical Engineer, S.A. Railways and Harbours; and Mr. W. C. van der Sterr, Director of Trigonometrical Survey Dept. of Lands.

Major Sturman will act as Chairman, Gen. Brink as Vice-Chairman, and Mr. P. E. Lindup as Secretary to the Board.

So far as can be learned, there is no Civil Aviation for the Air Board to control.

THE SOUTH AFRICAN AIR FORCE.

The present organisation is as follows:—

I.—Headquarters, comprising staff, clerical section, photographic section, wireless section, and balloon section.

II.—Aircraft Depôt, consisting of staff, permanent guard, administrative office, mechanical transport repairs, engine repair shops, aeroplane repair shops, clerical (repair shops) miscellaneous services, miscellaneous repair, aeroplane stores and balloon stores.

III.—One Squadron, consisting of headquarter flight and three air flights. The latter may be any combination of S.E.5 flight, Avro flight, D.H.4 flight or D.H.9 flight, with six machines in each flight.

S.E.5 Flight.—The cadre of a fighting and ground-strafing squadron.

Avro Flight.—The cadre of a training and artillery squadron. It will do more photographic and wireless work than the S E.5 flight.

D.H.4 and D.H.9 Flights.—The cadre of a long-distance communication, photographic, bombing and reconnaissance squadron.

The Nonqai, the magazine of the South African Forces, in the South African Air Force section, states that the third special course for ex-R.A.F. pilots was in progress early in 1924, and points out the fact that of the 22 pilots under instruction, seven having been found unsuitable is a justification for these courses.

Highly satisfactory results have been attained in Artillery and Air Force co-operation at Potchefstroom. Attention is called to the fact that from the Artillery point of view there are no maps in South Africa and therefore special means of co-operation have had to be devised and perfected.

The director of Air Services, Colonel Sir H. van Ryneveld, has been appointed a member of the Civil Air Board.

The following is from an order issued by H.R.H. the Governor-General at Potchefstroom in October, 1923:—"The Air Service played a most important part in the manœuvres—their contact patrol, and observation work being extremely efficient and of great value to the attacking Force. The Airmen are worthy of special praise for the thoroughness with which they carried out their arduous duties for three hours continuously under very bad flying conditions."

A SOUTH AFRICAN MAIL SERVICE.

According to reports in the South African press, a scheme has been worked out for the operation of an air mail service between Cape Town and Pretoria by the South African Air Force. A plan has been drawn up which provides for a relay service operating over the 1,000 miles that separate these two towns, three aerodromes besides the two terminal aerodromes having been laid down in the scheme. The service would provide training and practice for the S.A.A.F. as well as accelerate the delivery and despatch of English Mail matter, which would benefit the Transvaal community to the extent of two days.

PRETORIA—CAPE TOWN IN A DAY.

On Mar. 5, 1924, two D.H.9s (230 h.p. Siddeley "Puma" engines) belonging to the South African Air Force flew from Zwartkop aerodrome, near Pretoria, to the military training camp at Wynberg, near Cape Town, a distance of 1,000 miles, in 9 hours 45 mins. flying time. The machines were piloted by Capt. C. J. Venter, D.F.C., and Capt. H. C. Daniel, M.C., D.F.C.

This is the first occasion on which the Pretoria—Cape Town journey has been completed within the daylight hours of one day. Both the machines left Zwartkop at 05.55 hrs. and arrived at Wynberg at 18.30 hrs. after having made stops at Kimberley and Beaufort West for petrol.

The aeroplanes made the flight in order to co-operate with the Defence Force troops at Wynberg in field operations.

WEST INDIES.

The Bermuda & West Indies Aviation Co., Ltd., operated during 1920 with a Supermarine flying-boat and an Avro. The Supermarine was sent early in 1921 to the River Orinoco, in South America, where it was used with great success in surveying the delta photographically for signs of petroleum deposits.

Since then the machines have been laid up at Bermuda.

Early in 1924 a scheme to open a flying service all over the West Indies was organised by the West Indian Air Transport Co., Ltd., the chairman of which is the Viscount Curzon, M.P. It is to work in conjunction with The Aircraft Operating Co., Ltd., and is beginning in British Guano.

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BULGARIA.

Such air forces as Bulgaria possessed during the War, almost entirely German as regards personnel and materiel, have been suppressed under the terms of the Peace Treaty. A number of civilian machines (mostly French) were acquired during 1923 and Bulgarian pilots and mechanics are being trained on these so as to be able to operate war machines when occasion may arise in the future.

CHILE.

Aerial Societies :—

Aero Club de Chile. Offices : Santiago de Chile. President : Don Inje Matte. Secretary : Don Armando Venegas. This Club was admitted to the Federation Aéronautique Internationale in October, 1921.

Aerial Journals :—

Auto y Aero. Founded : August, 1913. Published monthly by Empresa Auto y Aero, Casilla 3319, Santiago de Chile.

THE NAVAL SERVICE.

Base : Valparaiso.

CHILEAN NAVAL AVIATION SERVICE.

Naval Aviation has its provisional Base at "Las Torpederas," Valparaiso, and from there flew the first machine in May, 1921, after the service had been organized.

The N.A.S. is attached to the Direccion de Artilleria, under Rear-Admiral Luis Langlois and the chief of N.A.S. since 1921 has been Commander Edgardo von Schroeders, having as Technical Adviser Lieut.-Col. J. Travers, late R.A.F. The former is now Naval and Air Attaché in London and the latter was killed while flying in England early in 1924.

In these two years, and under very trying and difficult circumstances, on account of lack of facilities in every respect, great strides have been made, and the following may serve as an example.

After studying all the coast of Chile, the harbour of Quinteros, 19° N. of Valparaiso, has been chosen as the principal base for the N.A.S., and the works of the great hangars and all the other buildings have just commenced.

It has been decided that the Naval pilots shall be the officers of the Navy List and receive the title of Specialist in Naval Aviation, more or less in the same lines as the officers of the Submarine Service. The instruction has been organised and two courses of instruction have been done, and the enthusiasm of the officers to join the N.A.S. is increasing every day. The instruction starts first at Quinteros with a short course as observers and then they go to the Aviation School at "El Bosque," near Santiago, and receive their brevet together with the officers of the Army. After that they finish their course in the Naval Base, when they get their titles as Specialist in Naval Aviation.

Several big flights have been made, the longest being that from Valparaiso to Coquimbo and return, about 500 sea miles ; done with three Shorts to join the Fleet, co-operate against submarines and practice scouting, navigation and formation.

Short machines have been hoisted on board the Dreadnought "Latorre," for spotting during the battle practice.

Wireless and telephony have been installed in several service machines and good practice has been done. Bombing exercises with real bombs and at the end of the period of instruction a bombing concours is made and a cup is given to the best ones. Practice of photography has been done and the aerial survey of the Naval Base at Quinteros has been made. Also aerial fighting with machine-gun cameras has been practised.

The President of the Republic has visited the new Naval Base at Quinteros, flying in the F.2A. Private tenders for a large flying-boat for the Chilean Navy have just been asked, and it is hoped that this is going to be the first of a large squadron of this type, as the policy of the Navy is to attach great importance to this kind of machine.

THE MILITARY SERVICE.

Aerodromes : Lo Espejo, near Santiago and Arica.
Military Aviation School : Lo Espejo.
Chief of the Service : General Contreras Sotomayor.
Commandant : Capt. Aracena.

The Army Flying Service in Chile was organised and formed by the British Aviation Mission under the command of Major F. P. Scott, R.A.F., in 1921.

The Mission trained 74 pilots in addition to the Chilean mechanics. They formed the workshops, etc., and laid down the whole Service on the basis of the Royal Air Force. They taught formation flying, wireless, aerial fighting, photography and artillery co-operation.

The aerodrome at Lo Espejo has accommodation for 50 machines, and has a good repair depot on the spot.

CIVIL AVIATION.

There is practically none.

CHINA.

Aerial Society :—

Aeronautical Federation of the Chinese Republic. Offices : Pekin. This Club was admitted to the Federation Aéronautique Internationale in October, 1922.

MILITARY AVIATION.

Early in 1920, Group Capt. F. V. Holt, C.M.G., D.S.O., went to China as Advisor in Military Aeronautics to the Chinese Government, and returned to England in 1923.

The Chinese Government bought 100 Vickers "Vimy" biplanes of the "Commercial" type. Some seventy were delivered, and have mostly been left to rot in their cases.

In October, 1920, General Chen Chung-Ming drove the Kwangsi militarists away from his home Province—Kwangtung, with the assistance of aeroplanes.

In 1921, General Chen's Expeditionary Force was sent to Kwangsi, at the request of the Kwangsi people, to drive away the Kwangsi militarists from the province, which was also done with success.

There are about fifty Chinese officers able to fly after a fashion, and one hundred are under training.

CIVIL AVIATION.

The Bank of Peking, in alliance with the British Handley Page Co., sent a number of Handley Page biplanes to China for mail-carrying purposes, and some of these have done a good deal of flying.

On the whole, Chinese aviation is comic rather than tragic. Nobody seems to know who is the Government, so nobody quite knows who owns or operates the aeroplanes, and the personnel are rather hazy as to whose orders they are to obey.

An Englishman with considerable personal knowledge of aviation who has recently left China gives a very interesting account of the true state of Chinese aviation.

It appears that in North China there are about thirty partially-trained Avro pilots. As soon as these pilots become at all promising, they are seized by the various Tuchuns, otherwise the local chieftains of rival armies, and are turned into military pilots, though it is rather difficult to discover just what military flying they actually do. There is not a single Chinese pilot who is qualified to take passengers on the Vickers "Vimy" commercial aeroplanes.

A good many of the so-called commercial aeroplanes have been seized by the assorted Tuchuns for use as military aeroplanes, but at the beginning of July there were still in the hands of the Pekin Government about twenty Avros, thirty "Vims" (that is to say the modernised version of the F.E.2d as redesigned by Vickers Ltd.), and about twenty "Vimy" commercials, some serviceable and some still not erected. There were also vast supplies of spare engines and spare parts for all types.

The old original Pekin Flying School at Nan Yuan has had to be closed down on account of interference by the local troops, who apparently did not approve of the so-called Government at Pekin. However, a new and apparently promising school has been started at Tsing Ho, about ten miles north of Pekin. One's informant says that if this school gets anything like a fair chance it ought to do well, as the Pekin Government still has in its service two very good British instructors, Messrs. Jones and Campbell Orde, two American pilot instructors and three British mechanics, all of whom have done excellent work under the most difficult conditions.

[NOTE.—Since then Mr. Campbell Orde has returned to England.]

None of the much-boomed commercial air lines have ever come into operation, partly owing to political opposition in the various provinces over which they were to operate and partly because of financial difficulties. The Government and the Aeronautical Department are said to be bankrupt, and the internal administration of the Aeronautical Department is completely chaotic.

There is some satisfaction in knowing that so far as there is any Chinese aviation British machines and British instructors

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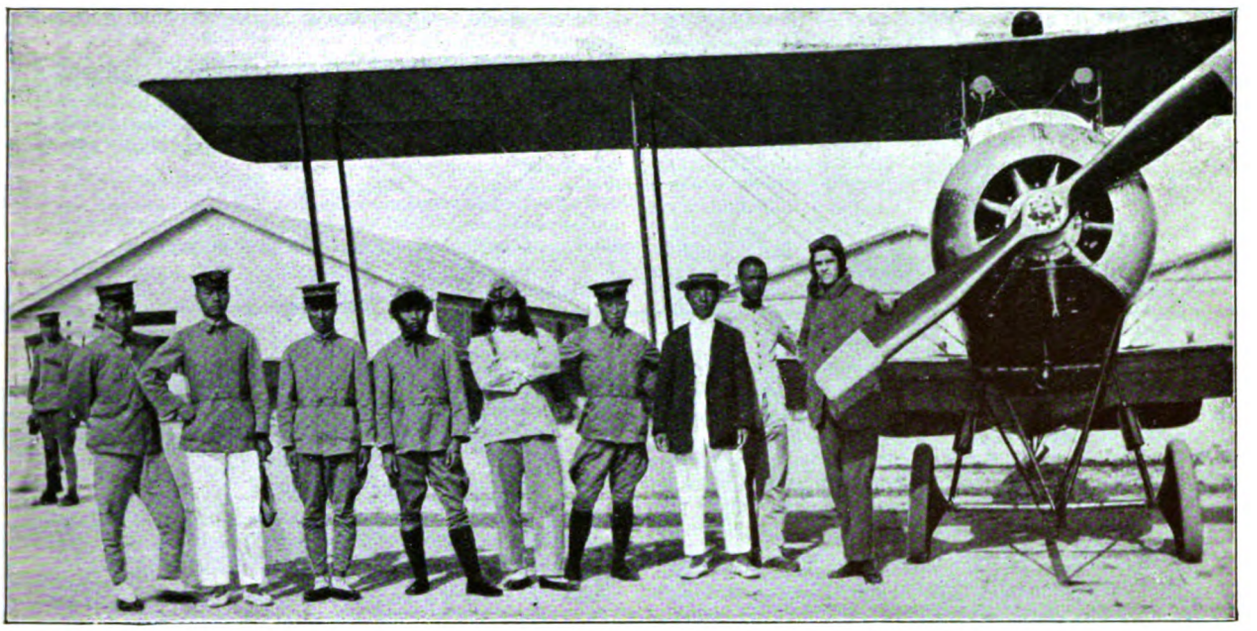


Chinese Officer Pilots, with Mr. R. McMullin (late R.F.C.) and a school Avro.

stand very high in the estimation of such Chinese as are capable of understanding the meaning of aviation. One's informant is considerably optimistic, in that he says that to his mind China is developing with extraordinary rapidity and that the country may pull itself together politically within the next four or five years.

Apparently, one of the chief reasons for the failure of Chinese aviation is that the Chinese Government itself never really wanted to develop commercial aviation, and the foreign Powers, which of course means the Allies of the late war, will not let it develop military and naval aviation. It strikes one that this is somewhat of a mistake, because if the Chinese Government in power were allowed to develop its naval and military aviation properly, with the help of British instructors, the result would probably be that the said Government, having a real Air Force at its command, would soon bring the various Tuchuns to heel, break up their armies of brigands and impose something like peace on the unfortunate country.

COLOMBIA.

Civil Air Company :—

Sociedad Colombo-Alemana de Transportes Aeros (S.C.A.D.T.A.) (Colombian-German Air Transport Co.). Date of Incorp.: December, 1919. Offices: Barranquilla. Services operated: Barranquilla — Neiva, Barranquilla — Cartegena — Santa-marta.

The Government has granted a subsidy of $100.00 a trip plus 30 cents per 15 grams for mail carried.

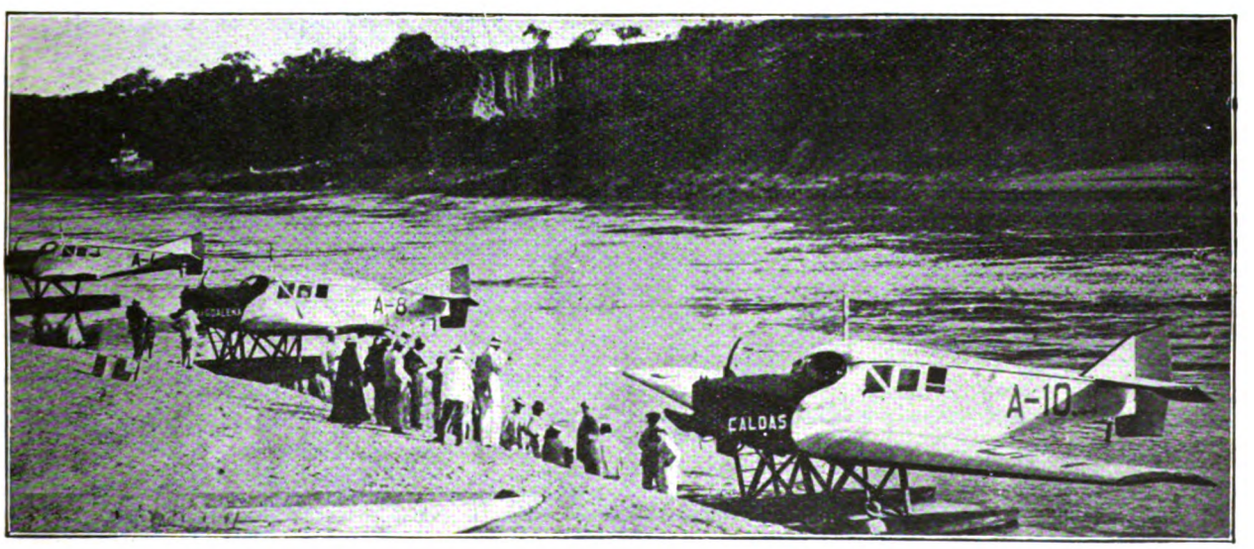
The Sociedad Colombo Alemana de Transportes Aereos is to-day the sole air-line firm operating regularly in Colombia. Founded towards the end of 1919 by German and Colombian interests at Barranquilla with a capital of 200,000 pesos-gold. The S.C.A.D.T.A. has organised and run a regular service and air line from Barranquilla, on the Atlantic Ocean, along the Magdalena River, to Girardot, whence a railway line runs to Bogota, the capital of Colombia, for a distance of 160 kms. This service flies twice a week and was opened during September, 1921.

Furthermore, an additional line is now in service from Cartagena (Mer des Antilles) to Barranquilla (120 kms.) and another from Giradot to Nieva (150 kms.). Additional lines are being organised from Santa Marta to Barranquilla and from Neiva to Cali.

The machines are of the type Junkers, J 13 or type "F," known in America as J.L.6 monoplanes. They arrived at Barranquilla during July, 1920, where the German pilot Hammer organised the air station.

During October, 1920, the machines arrived by air at Girardot as seaplanes. One of the machines was then fitted with a wheeled undercarriage and made a flight up to Bogota, where the machine landed on a plateau of 2,700 m. altitude.

The capital of the company is $200,000.00 Colombian currency. The stock of the company is distributed among Colombians and German residents of that country, the principal shareholder being the Departmento del Huila, which holds 1,000 shares worth $10,000.00.



The S.C.A.D.T.A. Fleet of Junkers Monoplanes.

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COLOMBIA—*continued.*

The officers and directors are as follows :—Ernesto Cortissoz (Colombian), President of the Company. Jacobo Correa (Colombian), Vice-President. Fritz Hammer, Technical Director W. Schnurbusch, Assistant. Albert Tietjen, Commerical Director. H. v. Krohn, Assistant.

Directors :—Cristobal Restrepo (Colombian), Rafael Maria Palacio (Colombian), Aristides Noguera (Colombian), Peter P. v. Bauer, Otto Kemmler, Hans Luhr.

The aviators are :—H. v. Krohn, Franz Behr, Otto Schute and Eduard Meyer. But in case of illness or some other unforeseen occurrence Mr. Fritz Hammer, the Technical Director, replaces the pilot thus prevented from operating his machine. The first three mentioned pilots have six years' experience, and the other two nine years.

In a speech on the occasion of the National Aviation and Scientific Exhibition organised by the S.C.A.D.T.A. (German Colombian Air Transport Company), Herr Hermann Kuelh, the Chief Engineer of the Scientific Section, announced that the S.C.A.D.T.A. had formed a sister company, to be known as the Santander Aviation Company, "Compania Santandereana de Aviacion," or "Cosada," and that a much bigger programme of activities would now be possible.

The Scientific Section of the S.C.A.D.T.A. not only deals with aerial photography and survey work, but with the study of air lines, meteorological observations and propaganda work.

CUBA.

(*The following information has been kindly supplied by the Cuban Authorities.*)

Aerial Society :—

Aero Club de Cuba. Offices : Ignacia 5, Havana, Cuba. Affiliated with the Aero Club of America.

MILITARY AVIATION.

The Aviation Corps of the Cuban Army is composed, for the present of an Aviation School.

Officers :—1 Flight Captain, 6 First Flight Lieutenants, 11 Second Flight Lieutenants and 98 Non-commissioned Officers and men.

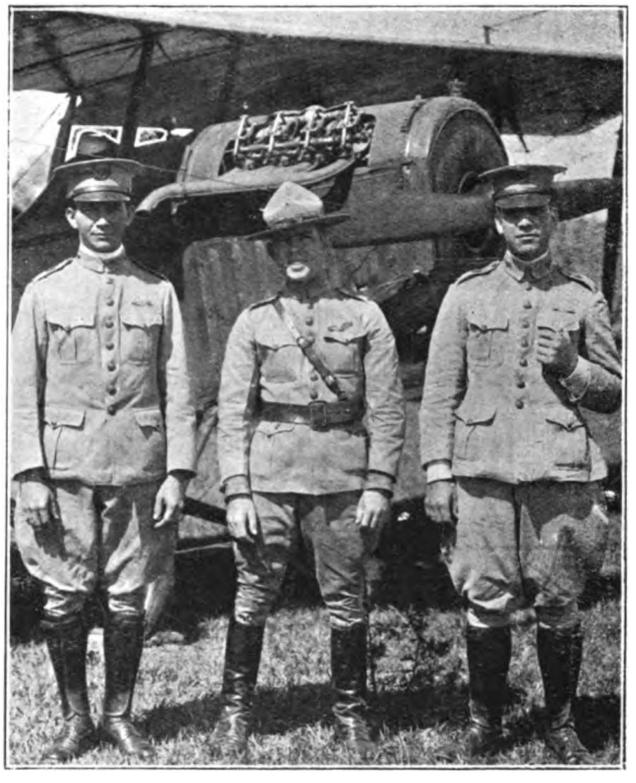
The Pilot Officers are graduated in the United States aviation schools.

Curtiss biplanes of the J.N. type are used for the training of the personnel.

CIVIL AVIATION.

Representatives of the French Farman firm tried to arrange services between Cuba and the United States and French pilots are already in the country.

These services did not materialise, but the American Aero-marine Co. has run a flying-boat service successfully between Havana and Key West, Florida.



Three Cuban Military Aviators :—Lieut. Luis Garcia, Lieut. Guillermo Martell and Signor Jose Terry.

Three Curtiss J.N.4's and some of the personnel of the Cuban Military Air Service.

CZECHO-SLOVAKIA.

(*The following information has been kindly supplied by the Czecho-Slovakian Authorities.*)

Aerial Society :—

Czecho-Slovakian Aero Club (Cesko-Slovensky Aeroklub). Offices : 4, Place Republic, Prague. President : O. Jindra. Affiliated with the Fédération Aéronautique Internationale.

Aerial Journal :—

Letectvi. Founded : 1920. Published monthly, price Kc.5, Vodickova 41, Praha II. Editor : K. Hypsa. The official organ of the Czechoslovakian Aero Club.

MILITARY AVIATION.

The Military Aviation is dependent on the Ministry of National Defence (Aviation Department). The Chief and Commander of the Air Force is Colonel-Engineer F. Kolarik.

The Czechoslovakian Air Force consists of three Aviation Regiments.

The garrison of Regiment No. 1 is at Prague. Regiment No. 2 is located at Olomouc. And Regiment No. 3 at Nitra. Air Force officers in active service are recruited from officers' corps of other arms and engage themselves voluntarily.

The training of the Air Force personnel is given at the Central Pilot School, where special courses are organised for pilots, for observers, for officers of other categories engaged in aviation, for wireless personnel, and also for training of reserve officers. Instruction is given to sergeant-pilots in aircraft armoury, aircraft mechanics and ground engineering, aerial photography, designing, etc.

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CZECHO-SLOVAKIA—*continued.*

Military Flying Grounds are provided at Prague, Olomouc, Cheb, Bratislava, Nitra, Kosice and Uzhorod.

During the year 1923, the Air Force has standardised the following aeroplanes of Czechoslovakian construction :—Smolik S.1 and Smolik S.2 with the Hiero 180 h.p. engine and the Maybach 260 h.p. engine. Fighting machine type A.18 with the Walter 185 h.p. engine and type B.3 with the same engine.

For training purposes, training machines types S.10 and type A.1 with the Mercedès 100 h.p. engines are standardised. All types of above-mentioned machines are of home design and construction.

At Praha, a Military Aeronautical Research Institute, with modern laboratory, is being organized. The organisation of the Institute is devised with much care. The Directory of the Aeronautical Institute consists of the following sections :—

(*a*) Construction of engines, kites, aerial photography, wireless telegraphy and aeronautical armoury.

(*b*) Section for aeronautical research, engine-tests, radio-telegraphy, fine-mechanics laying down of firing instructions.

(*c*) Meteorological research station.

(*d*) Research squadron and general service of meteorology.

The Institute has been charged with the organisation of the high courses of aeronautical technique and design. Special buildings of the Institute are to be built this year on the grounds at Letnany, near Prague, and will have their own test-flying ground.

A Technical Advisory Committee for the solution of exclusively technical problems, is composed of aeronautical specialists, professors of Czechoslovakian High Schools and representatives of the Aircraft Industry.

Special financial and scientific Committee, including Ministries interested in the matter, controls the realisation of the programme of the work in hand.

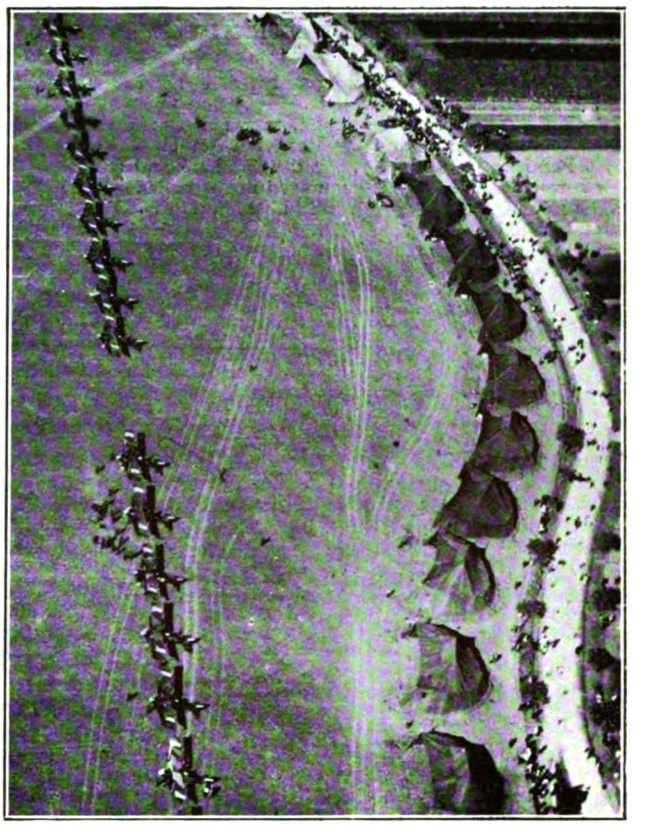
CIVIL AVIATION.

Civil Aviation is in the hands of the Ministry of Public Works at Praha (Prague) and incorporated in its Machinery and Electrotechnics Section and forms with the Automobilism a Sub-Section. At the head of this Section is M. Engineer Zdenko Janak, the counsellor of the above-mentioned Ministry.

The Ministry of Public Works uses the flying grounds of the State aerodrome at Kbely, near Praha, where custom facilities are granted to all civil aircraft. There is also the aerodrome at Vajnory, near Bratislava.

The most important aerodrome at Praha, the Metropolis of the Czechoslovac Republic, is equipped with most modern hangars, sheds and machine shops. Signalling devices are provided for the use of civil air traffic. All measures have been taken to build up a modern international aircraft station at Praha.

In the vicinity of the aerodrome, administration buildings of civil aviation are provided, where custom and air-mail offices stand. A modern and new powerful wireless telegraphy station completes the already existing installations and meets all requirements of a modern aerodrome.



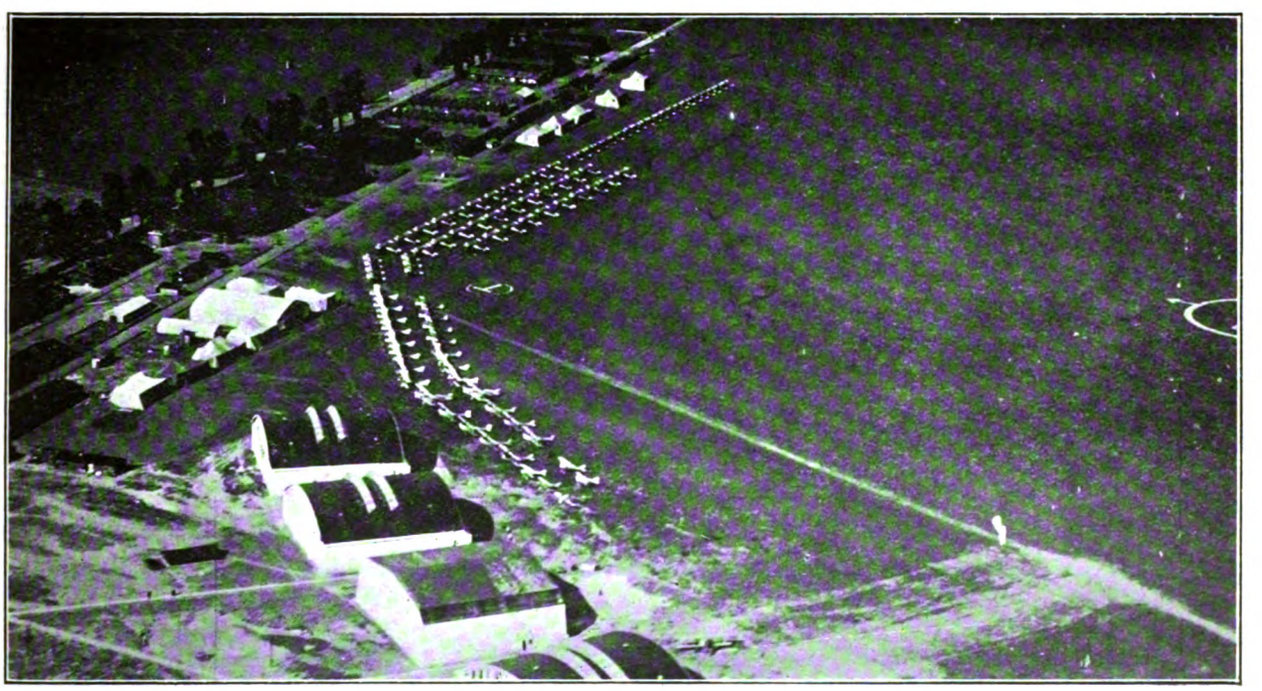
A Czecho-Slovakian Military Aerodrome.

At the present time, the aviation transport company " Franco-Roumaine," are charged with execution of transport connecting Paris, Strasburg, Praha, Warsaw, Vienna, Budapest, Bukarest, Constantinople.

On October 28th, 1923, the inauguration of the " Czechoslovak State Air Line " took place on the line Praha, Bratislava, Kosice, Uzhorod.

In the near future further lines to Hradec Kralové, Cheb, Plzen, Liberec, Brno, Moravska Ostrava, will be established, joining the above-said main line.

The aerodrome at Praha is already designated to be one of the most important stations in Europe on the recently chosen new line, London—Bruxelles—Köln o/R, which will run towards the Orient. We hope to start the air-transport during the early months of next year, 1924.



Prague Aerodrome, showing aircraft of the 1st Aviation Regiment lined up for inspection.

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CZECHO-SLOVAKIA—*continued.*

CLUBS AND SOCIETIES.

The most important club is the Ceskoslovensky Aeroklub, at Praha. It represents Czechoslovakian Aviation in the Fédération Aéronautique Internationale.

Besides the Aeroclub at Praha, mention should be made of the Aeroclub of Plzen and the Moravian Aeroclub at Brno.

At Bratislava, Pardubice, Hradec Kralové and at Olomouc, new aero-clubs are to be inaugurated in the near future.

The most important aeronautical association is the League of Czechoslovakian Pilots, at Prague, which, besides aviation propaganda made in Czechoslovakia, claims to ameliorate the material existence of pilots and assure them indispensable insurance.

In 1923, a new important institution, Masarykov Letecky Fond (M.L.F.) (Masaryk Aviation Funds) was opened at Prague, with the aim of propagating National Aviation among all public classes of the Czechoslovakian population.

The monthly *Letectvi* (Flying) is the official organ of all the above-mentioned aero-clubs and societies representing the whole of Czechoslovakian aviation. The offices of *Letectvi* are in the Aero Club's rooms, Praha II, Vodickova 41, Palac Ceské Banky.

The Military Aeronautical Research Institute publishes a monthly *Zpravy o Letectvi* (Notes on Aviation) with technical intelligence.

In the monthly *Vojensko Technicke Zpravy* (Military Technical Notes) edited by the Experimental and Research Department of the Ministry of National Defence, as well as in the *Zpravy Verejné Sluzby Technické* (Bulletin of Technical Public Works), issued by the Ministry of Public Works, is to be found permanent aviation intelligence.

The League of the Czechoslovakian Pilots publishes yearly an *Almanack of All World's Aviation.*"

THE AERONAUTICAL INDUSTRY.

Aeronautical Industry is represented by three aircraft works and three engine manufactories.

The Military Aviation Works at Kbely are constructing fighting machines of its own type. The Aero-Works and the Aircraft Factory Milos Bondy, late Avia, are constructing machines of both current military and civil commercial types.

The Aircraft Engine Corporation, Ltd., formerly Breitfeld Danek, at Prague, construct Hiero 180 h.p. and Blesk 120 h.p. engines, having just completed an engine of its own home-type, Perun 190 h.p. and Triglav 400 h.p.

The Walter Works, at Jinonice, construct the Walter 60 h.p., the Walter 185 h.p., the Walter 220 h.p., and the Walter 400 h.p.

The well-known Skoda Works, at Plzen, have just finished a licensed engine, Hispano-Suiza 300 h.p., and have in construction the engine of the Skoda 450 h.p. type.

In addition to the aeroplane and engine manufactories, a number of establishments to meet all requirements as to the aeronautical industry and aircraft equipment are to be found in our country.

DENMARK.

Aerial Societies :—

Det Danske Aeronautiske Selskab, 34 Amaliegade, Copenhagen.
Danske Flyvere (Danish Aviators), Klovermarksvej, Copenhagen.

Aerial Journals :—

Luftens Erobring. Issued by Det Danske Aeronautiske Selskab.

Flying Grounds :—

Avedöre (8 m. S.W. of Copenhagen).
Christianshavn by Copenhagen (Army).
Fanö (Summer months only).
(Kastrup, near Copenhagen, under construction, to be opened as a Civil Aerodrome.)
Lundtofte (8 m. N.N.W. of Copenhagen).
Odense (Fyen).
Ringsted (40 m. S.W. of Copenhagen).

MILITARY AVIATION.

The Danish Army Flying Corps, Klovermarksvej, Copenhagen C.

Officer commanding : Colonel J. P. Koch.

The Army Aeroplane Factory : Branch of The Army Technical Corps, Klövermarksvej, Copenhagen C.

NAVAL AVIATION.

The Royal Naval Air Service is a unit under the Admiralty.

Naval Air Stations :—

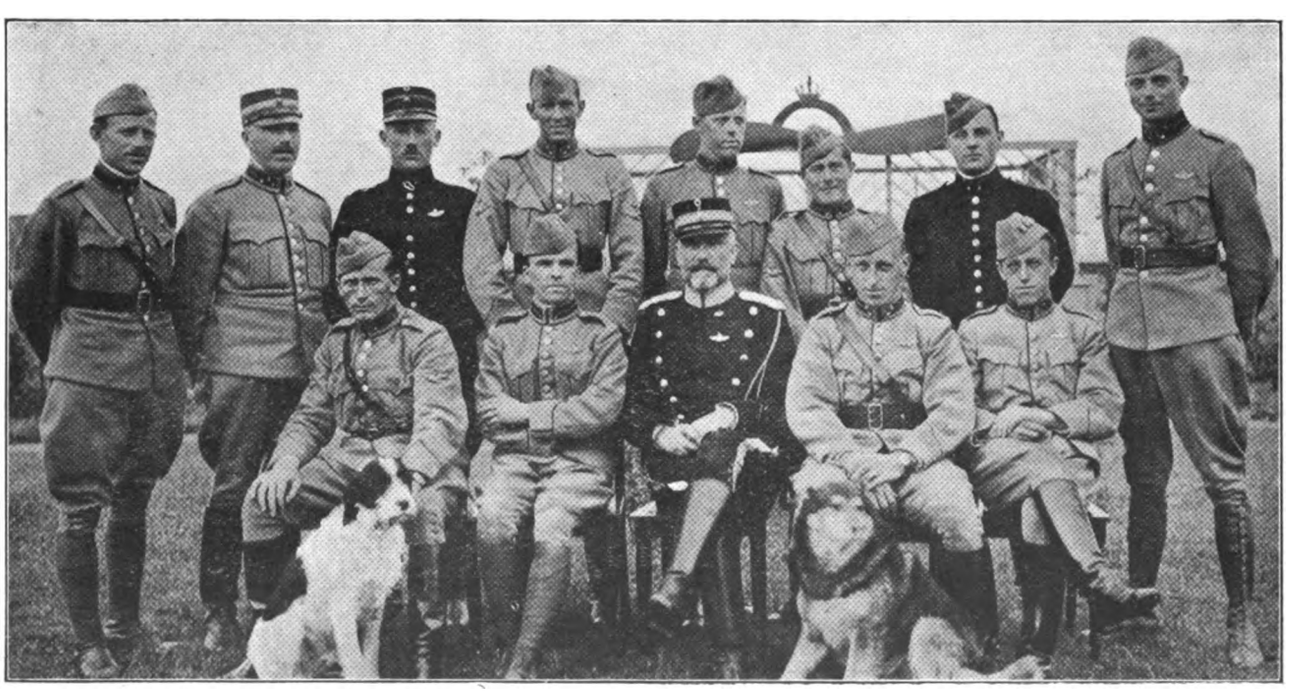
Seaplane station at *Copenhagen.*
Seaplane station at *Slipshavn.*
The future Copenhagen terminal aerodrome at *Kastrup* is used by the Naval Flying School.

Navy Aeroplanes :—

Friedrichshafen Biplanes, 220 h.p. Reconnaissance Machines. Royal Dockyard Seamonoplanes, 160 h.p., Self-defending Reconnaissance Machines. Royal Dockyard Flyingboats, 100 h.p., Royal Dockyard Sea-biplanes, 160 h.p., Training Machines. Avros 504 K. 100 h.p., Standard Training Machines. Curtiss Flyingboat, 150 h.p.

Chief Officers :—

NAVY :—
Commander D.R.N. A. Grandjean, Chef for Marinens Flyvevaesen, Marinens Flyvebaads Station, Copenhagen.
Engineer D.R.N. P. Eskildsen, Marinens Flyvebaads Station.
ARMY :—
Oberst Kock, R. af D., Dbm., FM., Chef for Haerens Flyver korps, Klovermarksvej, Amager.
Kaptain M. Kofoed Jensen, Chef for Haerens Flyvesmole, Klovermarksvej, Amager.



A Group of Officers of the Danish Flying Corps.

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DENMARK—*continued.*

The three D.H.9's (230 Siddeley "Puma" engines) belonging to the Danske Luftfartsselskab A/S. used on the Copenhagen—Hamburg service.

CIVIL AVIATION.

Civil Air Companies :—

Det Danske Luftfartsselskab, A/S. Director: W. Wulff. Offices: Amaliegade 29B, Copenhagen K. This company is a member of the International Air Traffic Association.

A daily air service from Copenhagen to Hamburg was operated with three machines, D.H.9, from April 17th to October 17th, 1923.

The statistic for this Danish airline was :—Number of scheduled flights, 311; number of accomplished flights (extra trips included), 304; Number of cancelled flights, (storm and fog), 23; number of cancelled flights (engine failure), 1; total number of kilometres flown, 89,480; total number of hours flown, 633; percentage of scheduled flights accomplished, 92.3%; number of passengers carried, 414; cargo and mail carried, 6,399 kgs.; total commercial load carried, 40,590 kgs.

A municipal airport for Copenhagen is in erection at Kastrup, on Amager Island. Meanwhile, Customs Service is available for land-going aircraft at the Army Aerodrome at Christianshavn and for seaplanes at the Naval Air Station at the Copenhagen Dock Yard.

The Ministry of Public Works, with the aid of The Army and Navy Aviations, superintends the Civil Aviation of the country, through registration and marking of aircraft, training new pilots for Government and private service, control of laying out of aerodromes, etc.

ECUADOR.

Italy sent a mission to Ecuador and appears to have been the first country to have obtained a footing.

In addition to the Italian effort, the Americans are reported to have offered to supply the Army of Ecuador with aeroplanes.

The following particulars have been received from the Acting Consul-General for Ecuador :—

SCHOOLS.

There is an aviation school in the village of Eloy Alfaro, which lies on the opposite side of the River Guayas, facing Guayaquil.

STAFF.—The Director of the School is Capt. J. Teo Anda, and there are special officials for the service of observation, topography, photography and meteorology and for all other branches indispensable for aviation.

PILOTS.—Almost every one belongs to the Military Mission from Italy, and under the direction of General P. Bitoli the officers of the Army have been instructed. The efficiency of the Italian Mission has been guaranteed by the Italian Government, and up to the present every satisfaction has given to the Ecuadorian Government as proves the fact, that although there are daily flights, up to the present no accidents have been registered.

Amongst the Pilots, special mention must be made of Capt. Petri, and also of the other Pilots Campagnoli, Cattaneo, Lodi, and the Ecuadorian Pilot Pedro Traversari; also of the Pilot Elia Liut, who specializes in aerial acrobatics.

The last feat worth while mentioning is the coasting of Ecuador in a few hours and without any mishap, effected in a hydro-aeroplane.

The Aviation School opposite Guayaquil is 6 feet above the sea. The Station at Quito is at 10,000 feet and the one at Salinas 8 feet. This last Station will be used in the near future as a Station for hydro-aeroplanes for flying along the sea coast.

ESTHONIA.

Civil Air Companies :—

"Aeronaut A/S," Talinnas (Reval) Kinga T. No. 1 Constructing and Operating Co. Running from and to Reval, Riga, Stockholm and Helsingfors.

Esthonian Air Traffic, A/S. Offices: Reval. This Company was formed by the Danske Luftfartselskab of Copenhagen and the Sablatnig Company of Berlin. It acts as agent for the German Air Line from Reval to Riga, Memel, Königsberg and Danzig.

This fragment of the former Russian Empire has a small but quite useful Flying Service, trained by British officers and equipped chiefly with British aeroplanes. The Esthonian pilots, are good, steady fliers, and did useful work in repelling the invasion by Bolshevik Russians.

For the following information one is indebted to Col. R. Mollerson, of the Esthonian Legation in London :—

Officers and Men of the Naval Wing, Esthonian Air Force.

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ESTHONIA—*continued.*

MILITARY AND NAVAL AVIATION.

The Esthonian Flying Service consists of a Training School, a Land and a Marine Wing, all of which are located at Tallinn.

The Wings are divided into separate squadrons, which in case of necessity can be detached and detailed for duty where required.

Both Wings have completely fitted workshops, where complete machines can be built, with the exception of the engines.

The two Wings and the chief command are under Captain A. Steinberg.

The Training School is under the command of Lieut. K. Haas, who is the senior and oldest war pilot in the Esthonian Flying Service.

In 1922 the first observers' course, the second pilots' course and the first aeroplane mechanics' course were completed.

Elementary flying instructions are given on 130 Clerget 504.K. Avros. Subsequent machines used are German D.F.W's, Halberstadt C.V's, Halberstadt Roland C.IV's, D.H.9's (Siddeley "Puma") and Scouts.

The Land Wing is under the command of Lieut. Vernik and consists of the following service types of machines :—Two-seater Halberstadt C.V's, two-seater Halberstadt Roland C.IV's, two-seater D.H.9's, Nieuport and Sopwith "Camels."

The Marine Wing is under the command of Captain J. Fischer and consists of service two-seater machines as follows :—Short (260 h.p. "Maori"), German F.F.49's, Single-seater M.II (le Rhône 110 h.p.).

In addition to the above, a Halberstadt C.V. machine has been fitted with floats tested in the air, and has been passed as airworthy.

All flying comes under the direct supervision of O. C. Training School.

CIVIL AVIATION.

The Esthonian Air Traffic Co. "Aeronaut" owns at present 5 six-seater monoplanes and 2 "L.V.G." biplanes. The monoplanes have been manufactured at the Dwigatel factory.

FINLAND.

Aerial Society :—

Aero Club of Finland (Soumen Ilmailuklubi). Founded : 30th November, 1919. Offices : Helsingfors, Sandhamn. President : Major A. Somersalo. Vice-President : Erik von Frenckell. Secretary : Major B. Martenson. This Club was admitted to the Fédération Aéronautique Internationale in October, 1921.

Civil Air Company :—

Finska Lufttraffik Aktiebolaget. Date of Incorp. : January, 1920. Offices : 13, Skillnaden, Helsingfors. Manager : Erik von Frenckell. This Company is a member of the International Air Traffic Association.

Aero OY. Date of Incorp. : November, 1923. Offices : 34A, Fredriksgatan, Helsingfors. Manager : B. Lucander.

Aerial Journal :—

Aero, Official Organ of the Aero Club of Finland. (Address : "Aero," Helsingfors.)

AVIATION STATIONS.

Civil.	Military.
Munksnäs (Helsingfors).	Sandhamn (Helsingfors).
Paloholmen (Helsingfors).	Utti.
	Viborg.
	Perkjärvi.
	Sordavala.
	Abo.

THE FINNISH AIR FORCE IN THE YEAR 1922.

(Kindly contributed by permission of the Finnish Army Authorities by Lieut. K. W. Chanson, Editor of *Aero*.)

ORGANISATION.

Finland is the only Northern country whose Air Force forms a separate Military Unit, i.e., a brigade under the direct subordination of the Ministry of War. Since the winter of 1920, General-Staff-Major A. Somersalo has acted as its Commodore and Chief. He has at his disposal a Staff consisting of four Sections, the personnel, the tactical, the technical and the economical, and their work is conducted by the Chief of the Staff.

The Air Force consists of the following detachments :—The Air Battalion at Sandham (Helsingfors)—which includes the school for pilots and observers, the repair shop and the Balloon Company—and Air Stations at Utti, Wiborg, Sordavala and Perkjarvi.

The Chiefs of the Battalion and Stations are subordinate to the Air Staff. To each Station are attached several reconnaissance, fighting and bombing squadrons.

OFFICERS AND MEN.

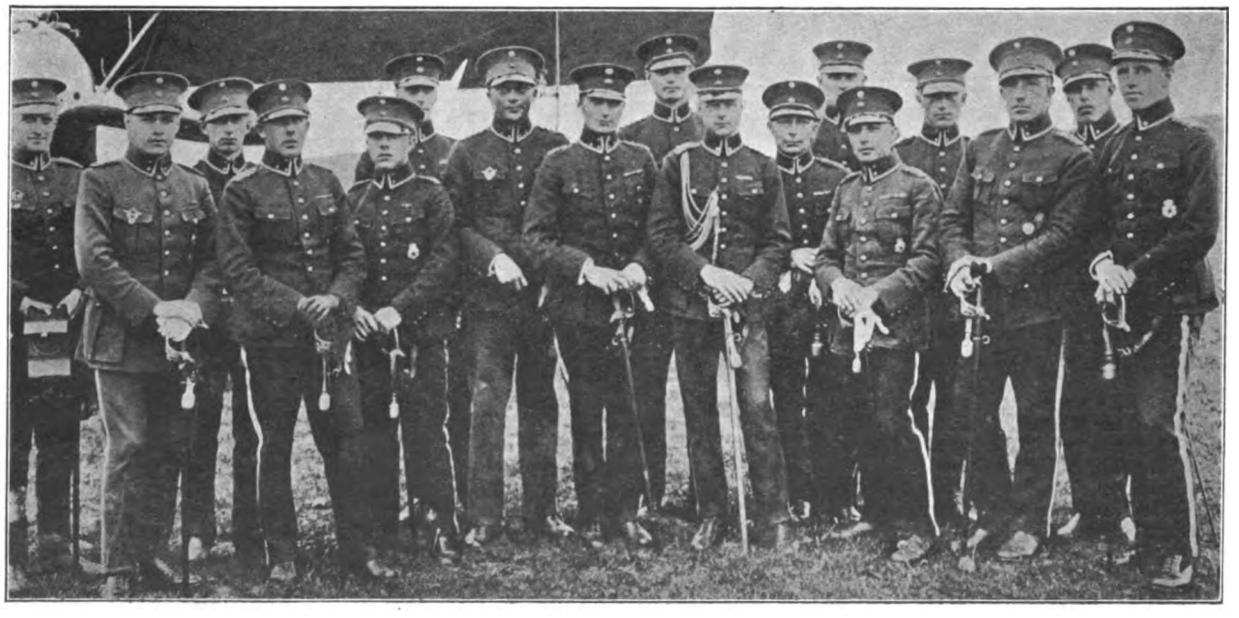
Immediately after the War of Independence was over, in the spring of 1918, thirty pilot and observer probationers were sent to German Air Schools to be trained. These, together with twelve others trained in the year 1919 in France, form the skeleton of the Flying Corps. Moreover, during the course of the last years, a great number of officers have, after careful selection, been transferred from other military units, especially from the Artillery and Infantry, to the Flying Corps.

The non-commissioned officers are in part men liable to military service and in part men who, having completed their compulsory service, have been, on signing a contract, attached for a year or two to the Flying Corps. On the other hand, the men are all liable for one year's service, as in other military units.

AIRCRAFT AND AIRCRAFT WORKS.

The main types of machines used in the Flying Corps this year have been :—The Bréguet, Spad and Fokker Aeroplanes, and the Georges Lévy and Friedrichshafner Hydroaeroplanes. Training has been carried out both on land and on water with Caudron biplanes.

[The first product of the Finnish Government Aircraft Works is described in the Aeroplane Section of this book.—Ed.]



Officers of the Finnish Flying Corps in full dress.

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FINLAND - *continued.*

THE FINNISH AIR FORCE IN THE YEAR 1923.

(Contributed by permission of the Finnish Army Authorities by Lieut. K. W. CHANSON, Editor of *Aero.*)

In *All the World's Aircraft*, 1922, there was, as is generally known, a detailed statement on the Finnish Air Force, its origin, organization, recruiting of officers and men, training, and also general points of view as to the atmospheric and the topographical conditions of the country, etc. In consideration hereof I shall in the following restrict myself to a short summary concerning the year 1923, i.e., I shall by some additional statements show the result of the work and the development of the Military Air Force of the country during the last year of activity.

FLYING ACTIVITY.

At first it may be emphasized as an encouraging factor that the intensity of flying has furthermore increased in comparison with previous years, as is shown in the table below. The activity has principally been concentrated on the training of the personnel of the Air Force in the more important branches, viz., long distance flying, formation and night flying, and flying in fog. The value of the long distance and formation flights has been further more increased by extending the flights, on the initiative of the staff, to places and districts which have not previously been so intimately connected with flying activity (the military stations are situated in the southern part of the country). The enthusiasm and the interest which was shown by the population of those districts visited is sufficient evidence of the efficiency of this means of propaganda.

Of the long distance flights here may be mentioned only a flight round Finland of about 1,800 kilometres, with two Finnish seaplanes, towards the end of October, and of the squadron-flights—two flights, Helsingfors—Viborg—Joensuu—Kuopio, a distance of 500 kilometres.

Of course, besides an intensive training of both pilot and observer pupils, the flying activity consisted also to a not insignificant extent in mapping. Extensive areas in the eastern part of the country (Karelia) were thus mapped out and the work could, thanks to modern topographical methods, be executed within a short time and at a comparatively small expense.

Also co-operation with other arms shows a marked improvement. During the numerous Army manœuvres and exercises, aeroplanes have been used and have shown themselves able to stand hard tests. This was especially the case during divisional manœuvres last summer, which lasted a week and at which the work of the Air Force obtained general recognition and was highly commended by those in command of the manœuvres.

The casualty statistics for this year compare somewhat unfavourably with the previous years. But when comparing these figures the long distance, night flights, etc., mentioned above, must be taken into consideration. That the climate and the topographical conditions of the country are for the most part unfavourable for flying, has already been emphasized.

MATERIAL.

During 1923 it has been more or less possible to standardise the types of machines used. The machines in use were the Breguet reconnaissance machines and the Gourdou-Leseurre, Fokker and Martinsyde scouts. Tests were made of these latter three in order to find out which was the most suitable for Finnish conditions. The French type, of which a large number has already been ordered, was found the most suitable; the comparatively low price of this machine was of course a factor in coming to this decision. In connection herewith, it may be mentioned that a scout monoplane is being designed and constructed at the Government Aircraft Works and will be tested during the spring of 1924.

Of the seaplanes, the Finnish I.V.Ls have been the only ones in use, and the Government Factory has during the year been found able to turn out all that were needed. An important improvement to the machine may also be mentioned; thanks to an airscrew constructed especially for the I.V.L. by Mr. K. W. Berger, this machine can now obtain a speed of 180 kilometres per hour, showing an increase of speed of 20 k.p.h.

As training machines, Caudron G.3 and C.60, both on wheels and pontoons, have been used.

A NOTICEABLE INITIATIVE.

In order to awaken and develop interest in the Air Force, the importance of this weapon for the defence of the country being extremely great, local associations of air defence were formed in towns of various parts of the country. These associations work for the development of flying, both civil and military, in the country by information work, obtaining flying material, training of reserve men from the civil guard for the need of the Air Force in case of war, collection of money, etc.

The intention is to found an organisation embracing the whole country in the immediate future, of which organisation these associations will be local branches or sub-divisions. The first positive result of these efforts has been reached, as the training of pilots from the civil guards has begun. The importance of this initiative for the defence of the country is evident.

CIVIL FLYING.

This branch is not very active at the present time. As was emphasized in the last year-book, both the then existing Finnish aero-companies were compelled to discontinue their activities owing to economic difficulties. On the contrary, the Esthonian company—Aeronaut—has, owing partly to the low value of the Esthonian currency, been able to maintain a regular post and passenger service during the greater part of the year 1923 between Reval and Helsingfors, in addition to great numbers of "pleasure trips" in the last-mentioned town—all without the slightest mishap.

It may, however, be mentioned with satisfaction that at the end of the year a Finnish company named Aero was founded, which has every possibility of greater success than its predecessors. Activity will begin in February, 1924, and embrace the routes Helsingfors—Reval and Helsingfors—Stockholm. The type of machine used will be the Junkers.

STATISTICS SHOWING FLYING ACTIVITY IN FINLAND, 1919-1923.

Year.	Hours flown.	Number of flights.	Number of accidents.	Killed.
1919	550	1,400	19	6
1920	900	3,000	12	7
1921	1,650	7,000	22	4
1922	2,800	10,200	19	0
1923	4,200	12,500	19	8

Proportion between number of flights and accidents per cent. :—1919, 1.35 per cent.; 1920, 0.40 per cent.; 1921, 0.31 per cent.; 1922, 0.19 per cent.: 1923, 0.15 per cent.

FRANCE.

[The following information has been kindly supplied by Capitaine de Corvette Sablé, Air Attaché to the French Embassy in London.—C. G. G.]

Aeronautical Associations :—

Aéro-Club de France, 35, Rue François 1er, Paris (8e).

Comité Français de Propagande Aéronautique, 29, rue de la Bienfaisance, Paris (8e).

Ligue Aéronautique de France (Association Générale Aéronautique, Comité National pour l'Aviation Militaire, et Ligue Nationale Aérienne réunis), 9, Rue Montaigne François, Paris.

Fédération Aéronautique Internationale, 35, rue François 1er, Paris.

Société Française de Navigation Aérienne, 19, rue Blanche, Paris.

Chambre Syndicale des Industries Aéronautiques, 9, rue Anatole de la Forge, Paris.

Note.—Besides these important associations, 33 societies are affiliated to the Aéro Club de France, in Paris and in the provinces.

Aeronautical Reviews and Journals :—

L'Aérophile (Revue Technique et pratique des locomotions aériennes), 35, rue François 1er. Directeur: M. George Besançon.

L'Aéronautique (Revue Mensuelle illustrée), Gauthiers-Villars et Cie., Editeurs, 55, Quai des Grands Augustins, Paris (6e). Directeur Rédacteur en Chef: M. Henri Bouché.

L'Air (Revue bi-mensuelle), 5, rue de l'Isly, Paris. Directeur: M. G. Roche D'Estrez.

La Vie Aérienne et Sportive (Revue mensuelle), 24, rue Taitbout. Directeur: M. Albert Dubarry.

Revue Générale de l'Aéronautique (Tous les 3 mois). Editeurs: Librarie Aéronautique, 40, Rue de Seine, Paris.

L'Aviation Française (Organe d'enseignement et de propagande Revue Mensuelle), 75, Boulevard de Courcelles. Directeur Général: M. Robert Zevaco.

La Technique Aéronautique (Revue Internationale des sciences appliquées à la locomotion aérienne. Revue Mensuelle), 5, rue de l'Isly. Rédacteur en Chef: M. André Lesage.

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FRANCE—*continued.*

A FRENCH MILITARY AERODROME.—The Military side of the terminal aerodrome of Le Bourgêt, near Paris.

Revue de L'Aéronautique Militare, Gauthiers-Villars & Cie. Editeurs, 55, Quai des Grands Augustins, Paris, (6e).

Bulletin de la Navigation Aerienne (publication mensuelle) (Organe officiel du Service de la Navigation Aérienne), Blondel La Rougery, Editeur, 7 rue St. Lazare, Paris (9e).

Les Ailes (journal hebdomadaire), 17, Bd. des Batignolles, Paris. Rédacteur en Chef: M. Georges Houard.

L'Aéro-Sports (Journal de l'aviation), 14, Place Clichy, Paris. Directeur Général: M. Gaston Bonnaure.

Aero Transport Companies :—

L'Aéronavale, 46, 48, rue de Villiers, Levallois-Perret.

Compagnie Franco-Roumaine de Navigation Aérienne, 22, rue des Pyramides, Paris (1°).

Compagnie des Messageries Aériennes et des Grands Express Aériens (réunies) (Air Union), 2, rue Galilée, Paris.

Compagnie Generale D'Entreprise Aéronautiques (Lignes Latécoère), 182, Bd. Haussmann, Paris.

These companies secure the working of the French Aerial Lines.

Besides these companies, there are in France societies more particularly interested in aerial work. Among these, one may mention :—

La Compagnie Aérienne Française, 18, rue de Nanterre à Suresnes.

Compagnie des Transaériens de Tourisme et Messageries, 72, rue de la Boétie, Paris.

Compagnie Méditerranienne de Transports Aériens, A. Maicon, Directeur, Base maritime à Villefranche S/Mer (Alpes Maritimes).

Besides these societies, others are actually formed for the purpose of working the routes to the Colonies.

Among these are the following :—

Compagnie Atlantique, rue Halévy, Paris.

Compagnie Aéronautique Française D'Extrême-Orient, 15, Place de la Madeleine, Paris.

Syndicat du Réseau Aérien Transafricain, 126, rue de Provence, Paris.

LANDING GROUNDS.

The list of the landing grounds and airship stations, both for land and sea aircraft, actually used, is as follows :—

Name of Aerodrome.	Nature of Aerodrome.
Abbeville	Terrain de secours.
Algers	Base d'hydravions.
Algers	Port secondaire.
Agadir (Morocco)	Terrain de secours.
Agadir	Escale d'hydravions.
Agen	Terrain de decours.
Ajaccio	Base d'hydravions.
Ambérieu	Station frontière.
Antibes	Base d'hydravions.
Angers	Terrain de secours.
Azemmour (Morocco)	Base d'hydravions.
Angoulême	Terrain de secours.
Arbaoua (Morocco)	Terrain de secours.
Avord	Terrain de secours.
Bayonne	Base d'hydravions.
Beauvais	Terrain de secours.
Berck s/Mer	Terrain de secours.
Biarritz	Station frontière.
Biskra	Station halte.
Bordeaux	Station halte.
Bordj bou Arreridj (Algeria)	Terrain de secours.
Le Bourgêt	Port aérien.
Bizerte	Escale d'hydravions.
Bone-Bougie	Escale d'hydravions.
Ajaccio	Station frontière.
Carcassonne	Terrain de secours.
Casablanca	Port secondaire.
Cazeaux	Terrain de secours.
Chalon s/Saône	Terrain de secours.
Chatillon s/Seine	Terrain de secours.
Chaux (Belfort)	Terrain de secours.
Chissey	Terrain de secours.
Compiègne	Terrain de secours.
Constantine	Station halte.
Dakar	Port secondaire.
Dijon	Station halte.
Fez	Terrain de secours.
Gabes	Station halte.
Gabes	Base d'hydravions.
Chardimaou (Tunisia)	Terrain de secours.
Le Havre	Station frontière.
Hyeres	Terrain de secours.
Kairouan	Terrain de secours.
Lyon	Station halte.
Macon	Terrain de secours.
Marseille (Marignane)	Port secondaire.
Marseille (Saumaty)	Escale d'hydravions
Montelimar	Terrain de secours.
Moulins	Terrain de secours
Mulhouse	Station frontière.
Marseilles (Marignane)	Base d'hydravions.
Nancy	Station halte.
Nantes	Station halte.
Nice	Station frontière.
Nimes	Station halte.
Oran	Base d'hydravions.
Oran	Station halte.
Orléansville	Terrain de secours.
Orléans	Terrain de secours.
Oudja (Morocco)	Terrain de secours.
Paray-le-Monial	Terrain de secours.
Perpignan	Station frontière.
Perpignan	Escale d'hydravions.
Pezenas	Terrain de secours.
Poitiers	Terrain de secours.
Poix	Terrain de secours.
Pontarlier	Station frontière.
Pujault (Avignon)	Terrain de secours.

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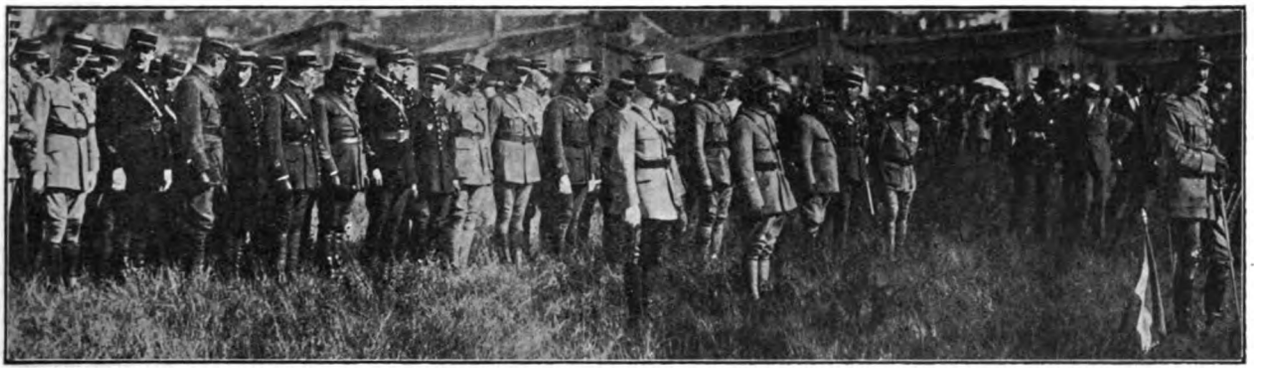

A gathering of French star turn pilots at a Guynemer Memorial Celebration.

Name of Aerodrome.	Nature of Aerodrome.
Romorantin	Terrain de secours.
Romilly s/Seine	Terrain de secours.
Rouen	Terrain de secours.
Saint-Dizier	Terrain de secours.
Saint-Inglevert	Station frontière.
Saint-Nazaire	Terrain de secours.
Saint-Quentin	Terrain de secours.
Saint-Raphael	Terrain de secours.
Saint-Rambert-D'Albon	Terrain de secours.
Sarrebourg	Terrain de secours.
Sousse (Tunisia)	Escale d'hydravions.
Strasbourg	Station frontière.
Sfax (Tunisia)	Escale d'hydravions.
Sfax	Terrain de secours.
Touggourt	Station halte.
Toulouse	Station halte.
Tours	Station halte.
Thonon	Escale d'hydravions.
Tunis	Station halte.
Valenciennes	Station frontière.
Villeneuve-Orly	Port secondaire.

Note.—The landing stations are divided into :—

"Port aérien" :—First class 'aerial harbour' with every facilities provided, customs, fuel, workshops, etc.

"Port secondaire" :—Second class 'aerial harbour' provided with the same facilities, sheds, etc., on a smaller scale.

"Halte" :—Permanent landing grounds usually provided with sheds and fuel and telephonic communications. In these 'stations halte' the meteorological reports are available.

"Terrain de secours" :—Emergency landing grounds. The ground itself is kept in order for safe running of machines, but no facilities are to be found.

"Base d'hydravion" :—Seaplane base. Same facilities as first-class 'aerial harbour.'

"Escale d'hydravion" :—Emergency seaplane basis.

"Station frontière" :—Border aerodromes. Any machines coming from or going to foreign countries have to stop for the custom clearance, unless they come from or go directly to a "port aérien" (first-class aerial harbour) where these facilities are also available.

ADDRESSES OF OFFICIAL DEPARTMENTS DEALING WITH AERONAUTICS.

Sous-Secrétariat d'Etat de l'Aéronautique et des Transports Aériens, 37, Avenue Rapp, Paris.

Service Technique de l'Aéronautique, 2, Rue Jeanne d'Arc, Issy-les-Moulineaux (Seine).

Service de la Navigation Aérienne, Bastion 68, 2 Bd. Victor, Paris.

Service des Fabrications de l'Aviation, Bastion 68, Bd. Victor, Paris.

Office National Météorologique, 176, Rue de l'Université, Paris.

Aéronautique Militaire (12e Direction), au Ministère de la Guerre, Boulevard St. Germain, Paris.

Aéronautique Maritime, au Ministère de la Marine, Rue Royale, Paris.

Aéronautique Coloniale, au Ministère des Colonies, Rue Oudinot, Paris.

CHIEF OFFICIALS.

(Correct as at end of 1923.)

M. Laurent-Eynac, Sous-Secrétaire d'Etat de l'Aéronautique et des Transports Aériens, 37, Avenue Rapp, Paris.

Ingénieur Général du Génie Maritime Fortant, Directeur au Service Technique de l'Aéronautique.

Lt.-Colonel Casse, Directeur du Service de la Navigation Aérienne.

Colonel Séguin, Directeur du Service des Fabrications de l'Aéronautique.

Colonel Delcambre, Directeur de l'Office National Météorologique.

Général Dumesnil, Directeur de l'Aéronautique Militaire.

Contre-Amiral Gilly, Directeur de l'Aéronautique Maritime.

MILITARY AND NAVAL AERONAUTICS.

SERVICE D'AVIATION MILITAIRE (Military Aviation).

Military Aeronautics constitutes a "Direction" (Department) (12e Direction) of the War Office.

Aeronautical questions principally concern this department. However, the General Staff remain competent to deal with all the problems of tactics regarding the aeronautical forces, i.e., to fix the number of flying units both for aeroplanes and balloons, and the place of these units on the territory; to determine the contingent which the Military Aeronautics is to receive every year from the class of young recruits, etc.

In the same way the "Service de l'Intendance" (Department for Equipment) deals with the supply of certain barracks; the "Service des Poudres" (Department of Explosives) deals with the purchase of petrol, oil and glycerine; the Artillery Department deals with the manufacturing and delivering of special arms, bombs, etc., as well as anything concerning the anti-aircraft defence (D.C.A.) and the ordinary rolling stock and transport.

Since a recent date, the Aeronautics has been considered officially as an "arm," which possesses its own regiments, brigades, 2 Divisions and a general inspection entrusted to a marshal.

Finally, technical information, flying matériel and its accessories and special rolling stock (workshop-lorries, winches) are provided by the Sous-Secretariat d'Etat for Air.

The 12e Direction is essentially entrusted with questions of general organisation, instruction and mobilisation.

The "Cabinet du Directeur" (Directorate) has charge of the special questions and officers, the general organisation and intelligence department.

The "1er Bureau" (first section) deals with everything concerning lighter-than-air.

The "2e Bureau" (second section) deals with aviation matériel.

The "3e Bureau" (third section), financial and legal matters.

And finally, the questions regarding the distribution of Forces are dealt by the "4e Bureau" (fourth section), according to the general instructions of the Army Staff (see above).

Aéronautique Maritime.

(Naval Aeronautics.)

The Admiralty comprises a "Service Central de l'Aéronautique Maritime" (central department of naval aeronautics), having at its head a rear-admiral. He is entrusted with the questions concerning naval aircraft and lighter-than-air, but he can in no way solve the problems concerning either tactics or aerial forces without consulting with the "Etat-Major Général de la Marine" (Naval General Staff) and the "Direction du personnel" (Staff Directorate).

One even finds in the naval aeronautics a certain condition imposed on the pilot officer which is unknown in the military aeronautics: the officers, who are only attached to the aeronautical departments, can only remain there for a limited period, after which period it is compulsory for them to take up again service at sea.

Finally, for the technical research and the purchase of matériel concerning the aeronautics proper (aeroplanes, seaplanes, motors, winches, etc.) the "Sous-Secrétariat d'Etat" (Under-Secretary of State) is the centre of information and compulsorily provides the Navy.

Concerning aviation, the Naval Department possesses four centres with full complement :—

Cherbourg (long-distance flying-boats and short patrols).

Brest.

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Saint-Raphael (Var), which is a mixed centre for aeroplanes and seaplanes, possessing at the same time a higher course school, a pursuit machine school and a "Commission permanente d'Etudes pratiques" (a permanent Commission for practical studies). Saint-Raphael is also the base for the aircraft attached to the Mediterranean Fleet.

Bizerte (près de Tunis).

Concerning the lighter-than-air, the Navy has four active centres :—

Saint-Cyr, which is at the same time the test station for non-rigid airships.

Rochefort, which is also used as a school.

Cuers (Var), which is able to accommodate both rigid and non-rigid airships and which is the centre of practical studies for lighter-than-air, "Commission d'Etudes pratiques d'Aérostation."

Baraki (près d'Alger).

Kite balloon centres :—Cherbourg, Brest, Toulon, Rochefort.

Schools :—Berre, St. Raphael, Hourtin, Rochefort.

ESTIMATES FOR THE FRENCH AIR FORCES IN 1923.

	Francs.
Military Aeronautics	462,000,000
Naval Aeronautics	105,540,081
Colonial Aeronautics	7,053,521
Office of the U.S. for Air (Civil Aviation, Research, etc.)	138,463,350

N.B.—Sums of equal size were voted for the various branches of French Aviation for 1924.

CIVIL AVIATION.

In France, Civil Aviation is dependent on the "Service de la Navigation Aérienne" (Department of Aerial Navigation), which, in its turn is dependent on the "Sous-Secrétariat d'Etat de l'Aéronautique et des Transports Aériens" (Under-Secretary of State for Air and Aerial Transports).

French Air Lines System (Its actual position).

In spite of difficulties of all kinds which have been met with, on the one hand, to find the suitable grounds, and on the other hand, to overcome the formalities of administration relevant from purchases, the French Air Lines system is actually well on the way to progress satisfactorily.

The following routes have been organised in less than three years and put in working order :—

Paris—Londres.
Paris—Bruxelles—Amsterdam.
Paris—Strasbourg—Prague—Varsovie.
Prague—Budapest—Bucarest.
Marseille—Barcelona.
Antibes—Ajaccio.
Toulouse—Casablanca.
Casablanca—Oran.

Working of the Aerial System.

The aerial system we have mentioned above is actually worked by five companies. Other companies are being constituted.

The Compagnie des Messageries Aeriennes et des Grands Express Aeriens (Air Union) secure a regular service on the routes Paris—London.

The Compagnie Franco-Roumaine joins Paris to Prague and Varsovie on the one hand, and to Prague and Bucharest on the other hand.

The Compagnie Generale d'Entreprises Aeronautiques Látecoère joins Toulouse to Casablanca, Casablanca to Oran and Marseilles to Barcelona.

The Aeronavale secures the service Antibes—Ajaccio.

RESULTS.

In 1919, in spite of the precarious installations of the landing grounds, four companies of Aerial Navigation effected regular transports by air, making 988 journeys, covering 265,784 kilometres and transported 558 passengers, 7 tons of goods and 400 kilogrammes of post.

In 1920, eight companies effected 2,386 journeys, covering 853,959 kilometres, carrying 1,379 passengers, 48 tons of goods and 4,000 kilogrammes of post.

In 1921, these same companies effected 6,232 journeys, covered 2,353,455 kilometres, carried 9,427 passengers, 166 tons of goods and nearly 10,000 kilogrammes of post.

In 1922, six companies covered 2,798,446 kilometres, carried 6,841 passengers, 388,509 kilogrammes of goods and 40,367 kilogrammes of post.

In 1923, six companies covered 3,387,195 kilometres, carried 11,638 passengers, 969,000 kilogrammes of goods and 328,449 kilogrammes of mail.

SUPPLEMENTARY INFORMATION.

The following information concerning the detail organisation of French Aeronautics has been received from unofficial sources, but may be taken as being reasonably accurate :—

The Work of Departments.

The Under-Secrétariat of State for Aeronautics and Aerial Transportation, 37, Avenue Rapp, Paris, was formed in January, 1920, by M. Millerand, at that time President of Council, and M. Pierre Etienne Flandin was appointed the first Under-Secretary of State for Aeronautics.

Primarily, it controls technical progress in French Aeronautics. In this it is seconded by a great establishment, the Technical Service of Aeronautics, usually known as the S.T.Aé.

Secondly, the Under-Secrétariat of State orders the aeronautical matériel required by the War Office, the Navy and the Colonial Office to centralize all State orders to manufacturers, rather than to allow each department to place its own orders. This is to ensure regular supplies, and at the same time support the whole of the French aeronautical industry. Here the Under-Secrétariat of State is aided by the Aeronautical Manufactures Department (Service des Fabrications de l'Aéronautique) usually known as the S.F.A.

Thirdly, the Under-Secrétariat of State controls everything relating to civil aerial navigation (creation of lines, subsidies, contracts with Transportation Companies, etc.). In this the Under-Secrétariat is aided by the Service of Aerial Navigation (the S.N.Aé.), founded on the model of the S.T.Aé. and S.F.A.

The Under-Secrétariat of State has taken over and reorganised the central Weather Bureau, turning it into a National Weather Bureau (Office National de Météorologie).

Furthermore, the Under-Secrétariat of State controls the operations of the Disposals Board (Société Commerciale des Stocks de l'Aviation) created in 1920 to liquidate the aeronautical material thrown on the market by the cessation of hostilities.

The following explains the work of the Sub-Departments mentioned above :—

(A) **Technical Service (S.T.Aé.)** (2, Rue Jeanne d'Arc, Issy-les-Moulineaux). This Department possesses what is stated to be the largest wind-tunnel in the world. The organization follows two lines : (*a*) Theoretical Studies, (*b*) Testing and Experiments. The first is undertaken by the "Service des Etudes," the second by the "Service des Essais et Experiences." Thus the S.T.Aé. draws up the programmes for the construction of new material required by the Army, Navy or Colonies, attends to the equipment and armament installation of aircraft, tests all new devices and decides the value of inventions or improvements submitted to it by manufacturers or engineers. The Director of the S.T.Aé. controls the whole establishment.

Each of the two divisions is further divided into Sub-Sections : (*a*) In the "Service des Etudes," The Aviation Section, The Seaplane Section, Engine and Propeller Section, Aerial Navigation Section, including ground organization and special materiel (electric apparatus, wireless, photography, hangars, workshops, etc.), Armament Section. (*b*) In the "Service des Essais et Expériences," The Research Section, The Laboratory Section, including the laboratories at Issy-les-Moulineaux, the Eiffel Laboratory, the Deutsch de la Meurthe Aerotechnical Institute at Saint-Cyr, and the plant at Chalais-Meudon, The Test Section with the Villacoublay aerodrome at its disposal, The Information Section, The Collection Section comprising models of all known aircraft (ancient or modern) got together at Chalais Meudon by the S.T.Aé.

(B) **The Aeronautical Manufactures Department (S.F.A.)** (Bastion 68, 2, Boulevard Victor, Paris). This controls the production and the repair by private firms of the matériel for the Government Aeronautical Services (aeroplanes, seaplanes, hydrogliders, balloons, engines, electrical apparatus, telephonic, telegraphic and photographic matériel, waggons, trucks, hangars, ingredients, etc.). It makes contracts and is responsible for payments. It ensures shop inspection of manufactures, undertakes the acceptance tests of matériel and oversees the packing and dispatching of matériel.

Also, for mobilization purposes, this Service prepares for a rapid and methodical development of aeronautic construction (list of factories in which each type of aeroplane is made, maintaining sufficient stocks of drawings, jigs, descriptive matter, necessary models, etc.).

(C) **Service of Aerial Navigation (S.N.Aé.)**, Bastion 68, 2, Boulevard Victor, Paris. The name of this Service indicates its functions. These are :—Questions of aerial locomotion, such as organization of airways ; mapping of airlines ; selecting, acquiring and equipping terrains ; ground organization, i.e., building sheds, shops, offices, water supplies, wireless stations, signals ; agreements with navigation companies ; application of regulations governing air traffic ; allotment of bonuses and subsidies ; medical examination of civil pilots ; examination of candidates for flying certificates.

(D) **The National Weather Bureau (O.N.M.)**, 176, Rue de l'Université, has charge of collecting and disseminating atmospheric data. It controls observatories and stations over all French territory and communicates with similar

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establishments in foreign countries. It also comprises a scientific section.

There are also various Advisory Committees, such as the Technical Advisory Committee, the Medical Advisory Committee, the Meteorological Advisory Committee.

The Inspection Générale.

Parallel with the "12e Direction" of the War Office (described hereinbefore officially) is the "Inspection Générale de l'Aeronautique Militaire," with offices at 4, Boulevard des Invalides, Paris. This General Inspectorship derives its authority directly from the Minister of War, and not from the Army Aeronautical Department. It was formed, in 1921, and its aim is: (*a*) To keep the Ministry, the Supreme War Council, and the Army Headquarters informed as to the general situation of the Army Air Service, its requirements and its progress. (*b*) To ensure in all troop units and establishments the unity of view necessary for the proper application of the regulations. (*c*) To study all questions relating to the aerial defence of the country (D.C.A.).

Details of the "12e Direction."

The Department of Military Aeronautics ("12e Direction") of the War Office includes:—

(A) **The Aeronautical Technical Inspectorate (I.T.Ae.),** Bastion 43, Boulevard Bessières, Paris. This controls the technical side of the Military Air Service, superintends the upkeep of matériel, examines technical propositions coming from aviation officers, follows tests of new matériel in the units, undertakes experiments and keeps in touch with the S.T.Aé.

(B) **Supply Department of Aviation Materiel** (Direction Générale du Ravitaillement en matériel d'aviation, or D.G.R.M.A.), Bastion 71, Boulevard Victor, Paris. This links the various depôts and stores of aviation matériel and regulates supplies for air units. The D.G.R.M.A. also maintains the aviation matériel constituting the war reserve.

It has under it the following depôts:—Special Aviation Depôt, No. 1 (E.S.A.1), at Dugny, near Paris, for aeroplanes. Special Aviation Depôt, No. 2 (E.S.A.2), at Nanterre (Seine-et-Oise), for engines, spares and accessories. Special Aviation Depôt, No. 3 (E.S.A.3), at Saint-Cyr, for mechanical transport, spares and accessories. Special Aviation Depôt No. 4 (E.S.A.4), at Dugny, for portable sheds, tents, shelters, etc. General Aviation Stores No. 1, at Romilly-sur-Seine (Aube); No. 2, at Longvic-les-Dijon; No. 3, at Romorantin (Loir-et-Cher); No. 4, at Versailles-Mortemets. (Each of these Stores is responsible for the supply of matériel to the units stationed within their area.) The Shipping Stations of Marseilles and Bordeaux, which receive and ship aviation matériel to the troops in North Africa and the Levant.

(C) **The Central Depot for Military Balloon Matériel** (E.C.M.A.) at Chalais-Meudon, which supplies Balloon Units with matériel.

(D) **The Schools.** There is now only one school for Aviation Pilots, and that is at Istres, in the Department of the Bouches-du-Rhône. The Minister of War has arranged with the civilian Flying Schools at Buc, Orly, le Crotoy, Nimes, Angers, etc., that a certain number of young men shall have a year's training in aviation before taking up their military service.

At Cazaux (Gironde) is a school for machine-gunning and bombing. Cazaux is also an instruction camp, and units go there for special training with actual targets and bombing.

At Bordeaux is a finishing school for mechanics, riggers, adjusters, etc.

At Cosno is a school for advanced technical training of balloon personnel.

At Montargis an instruction centre for anti-aircraft work (D.C.A.).

(E) **The Army Weather Bureau.** The head of this bureau is also the head of the National Weather Bureau, and thus the two services are adequately linked.

(F) **A Centre of Advanced Aeronautical Study,** operating at Versailles.

Naval Aviation Details.

The Naval Aeronautical Department was formed during the War. The Central Service of Naval Aeronautics has its headquarters in the Rue Royale, Paris. (See Official Notes.)

The Naval Department has two aviation centres completely equipped and manned, namely:—Cherbourg (long-distance and patrol seaplanes) and Saint-Raphaël (Var), which has both aeroplanes and seaplanes, also a training school, a pursuit school and a permanent committee for the study of improvements in aerostatics. Saint-Raphaël is also the base for aviation squadrons in the Mediterranean.

Brest and Bizerto are armed centres with reduced forces. Lorient, Ajaccio, Kenitra (Morocco) have only the number of men required to guard them, but can soon be put on a war footing if necessary. Hourtin (Landes) is a school for observers and Barre (Bouches-du-Rhône) a school for seaplane pilots.

The Navy has also three armed centres for airships:—Saint-Cyr, which is also a reception park for non-rigid airships. Rochefort, where there is a school. Cuers (Var), where both non-rigid balloons and rigid airships can be housed and where there is a Committee for Aerostatics charged with examining all questions relating to improvements in aerostats. The two airships, "Méditerranée" and "Dixmude," were delivered to France by Germany in execution of the terms of the Peace Treaty. The former is now at Cuers and the latter was lost in the Mediterranean while on a practice flight extending over North Africa. Near Algiers, the Baraki aviation centre is in reserve. Near Marseilles, the Aubagne centre has been put on a peace footing. The centres of Montebourg (Manche), Guipavas (Finistère), Bizerte and La Sénis (near Oran) are held by reduced personnel or simply kept as reserve stations.

The late French Naval Airship "Dixmude" over Paris while engaged in making its record flight.

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At Brest, Lorient and Bizerte are parks for captive balloons in reserve. At Toulon is a school for training observers for captive balloons.

Colonial Aviation.

Colonial Air Services are dealt with by a bureau which is part of the Colonial Ministry, 27, Rue Oudinot, Paris.

At present there are two squadrons in Indo-China and one in West Africa. Those in Indo-China comprise both aeroplanes and seaplanes. All have hydro-gliders (hydroplanes driven by airscrews), aerial photography and wireless sections, weather bureau, and shops and stores, which serve as a park.

It is intended to strengthen these squadrons and to form others in Madagascar. But as the cost is beyond the resources of the Budget and the colonies themselves do not give the financial help required, this has to be postponed for the present.

The Budget.

The sums allotted to the various departments in the Budget of 1922 are as follows :—

	Francs.
(*a*) Under-Secrétariat of State	147,240,867
(*b*) Ministry of War (Military Air Service, including Algeria, Tunis and Morocco, but excluding the payroll for France and the various expenses of the Air Forces on the Rhine and in the Levant)	246,397,282
(*c*) Naval Ministry (Maritime Air Service) ..	37,813,543
(*d*) Colonial Ministry (Colonial Air Service) ..	4,991,000

THE ORGANISATION OF THE MILITARY AIR SERVICE.

[The following information has not been supplied from French official sources.—C. G. G.]

The Military Aeronautics has under its direction a certain number of aviation and balloon units and a certain number of departments or establishments.

The units are grouped into 2 Divisions, which are in their turn subdivided into Brigades, Regiments and Groups. The groups are composed of escadrilles varying in number.

Fighting Escadrilles consist of 10 machines.

Observation Escadrilles consist of 8 machines.

Day Bombing Escadrilles consist of 10 machines.

Night Bombing Escadrilles consist of 8 or 10 machines (according to type).

Machines in service are :—

Single-seat Fighters ..	Nieuport type 29.C.1, fitted with 300 h.p. Hispano-Suiza engines.
Reconnaissance ..	Breguet type 14.A.2, fitted with 300 h.p. Renault engines.
Day Bombers ..	Breguet type 14.B.2, fitted with 300 h.p. Renault engines.
Night Bombers ..	Breguet type 16.B.N.2, fitted with 300 h.p. Renault engines.
Night Bombers ..	Farman type F.60, fitted with two 260 h.p. Salmson engines.

The balloon units are grouped into battaillons, and these battaillons constitute two regiments.

Régiments d'Aviation.

(Aviation regiments.)

2me Régiment "d'aviation de chasse" (Fighters)	Strasbourg.
3me Régiment "d'aviation de chasse" (Fighters)	Chateauroux.
11° Régiment "d'aviation de bombardment de jour" (day bombing)	Metz.
12° Régiment "d'aviation de bombardment de jour" (day bombing)	Neustadt.
21° Régiment "de bombardement de nuit" (night bombing)	Nancy.
22° Régiment "de bombardement de nuit" (night bombing)	Chartres.
31° Régiment "d'aviation d'observation" (reconnaissance)	Tours.
32° Régiment "d'aviation d'observation" (reconnaissance). To this Régiment are attached two fighting escadrilles	Dijon.
33° Régiment "d'aviation d'observation" (reconnaissance). To this Régiment are attached three fighting escadrilles	Mayence.
34° Régiment "d'aviation d'observation" (reconnaissance). To this Régiment are attached three fighting escadrilles	Le Bourgêt.
35° Régiment "d'aviation d'observation" (reconnaissance)	Bron
37° Régiment "d'aviation d'observation" (reconnaissance)	Maroc.
38° Régiment "d'aviation d'observation" (reconnaissance). To this Régiment are attached four fighting escadrilles	Thionville.
39° Régiment "d'aviation d'observation" (reconnaissance)	Syria.
4 Independent Reconnaissance Groups (each of two escadrilles) at	Algiers. Oran. Setif. Tunis.
1 Independent Reconnaissance Group (three escadrilles) at	Pau.

The total number of Military squadrons is 139.

The French Striking Force.

The First French Air Division (which consists of Fighting, Day Bombing and Night Bombing escadrilles) was, until the end of 1923, always considered as the French "striking force." It consisted of 30 Fighting escadrilles, 20 Day Bombing escadrilles (range of 3½ hours) and 12 Night Bombing machines (range of 5½ to 7 hours according to type), making a total of 608 machines.

In addition to these, the French had in France and Occupied German territory 5 Observation Regiments and 1 Observation Wing, in which there were about 370 machines.

All these were serviceable and squadrons were up to full strength in pilots and mechanics. The total of 1,000 first-line machines talked about in the House of Commons is, therefore, very nearly correct for 1923 and has now been exceeded.

Since the beginning of 1924, the French organisation has been completely altered. There are now 2 Air Divisions in which are grouped not only Fighting and Bombing, but also Observation machines. Fighting machines have also been attached to Observation Regiments. This has consequently somewhat changed the character of the "striking force," which must not, however, be considered as weakened in any way. The total number of squadrons has, indeed, been increased by 8, owing to the formation of a new Observation Regiment (No. 38).

Régiments d'aèrostation.

(Observation Balloon Regiments.)

The balloon units are grouped into two regiments :—

1er Régiment at Versailles comprising 4 battaillons :—

1er Battaillon	Epinal.
2me Battaillon	Compiegne.
3me Battaillon	Versailles.
4me Battaillon	Angers.

2me Régiment at Nevers comprises 3 battaillons :—

1er Battaillon	Nevers.
2me Battaillon	Toulouse.
3me Battaillon	Privas.

Artillerie Anti-aérienne.

(Anti-aircraft Artillery.)

The five artillery regiments placed at the disposal of the "D.C.A." (anti-aircraft) have been attached to the artillery since the 1st of January, 1923.

Centres d'Instruction d'Aviation.

(Aviation Instruction Centres.)

Five aviation instruction centres are directly under the orders of the "Direction de l'Aéronautique Militaire" (Department of the Military Aeronautics) :—

Centre d'Etudes Aéronautiques, at Versailles (Aeronautical studies)—(general aeronautical instruction for officers, N.C.O's.)

Centre d'Instruction d'Aviation à Istres, pour la formation des pilotes (flying school).

Centre d'Instruction de tirs et de bombardements, à Cazeaux, pour la formation des observateurs, mitrailleurs et bombardiers (training of observers, gunners and bombers).

Centre d'Instruction des spécialistes de l'aviation, à Bordeaux, pour le perfectionnement des spécialistes de l'aviation (higher course and refresher course for the various specialists of aviation).

Centre d'Instruction d'Aviation, à Avord, pour la formation des officiers observateurs (higher course for observer officers only).

FRENCH AIRCRAFT CARRIERS.

The following are the aircraft-carrying ships owned by France :—

BEARN.

Was laid down, in 1914, as a Dreadnought of the "Normandie" class. Launched in April, 1920, construction having been suspended during the War. Has now been re-designed as a Fleet Aircraft Carrier, and is to be completed by April, 1925. No details available.

Length : 576 ft.
Beam : 86.4 ft.
Speed : About 24 kts.

BAPAUME.

Is a converted "sloop" or "aviso" type boat. It has a flying-off deck from bridge-house to bows, otherwise her appearance is like any other boat of the "Arras" class. She is attached to the St. Raphael Naval Air Station.

Displacement : 700 tons.
Length, o.a. : 246 ft.
Beam : 28.5 ft.
Draught : 9.2 ft.
Guns : 1—14 pdr. A.A.
S.H.P. : 4,000.
Speed : 17.5 kts.
Machinery : Geared turbines.
Fuel : Oil only.

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GERMANY.

[NOTE.—Owing to the restrictions of the Versailles Treaty, Germany is not allowed to own any warlike aircraft. And owing to the action of the *Commission Aéronautique Inter-Alliée*, the production of civilian aeroplanes of useful size has been prevented. Consequently, Germany's best designers of big machines have been driven to seek employment abroad, many in Russia, some in Sweden, some in Denmark, some in Italy, some in Holland, one at least in Britain and (strangely) some in France. Nevertheless, German pertinacity has done much to make a success of air lines, of which a network has been organised all over Central Europe. And many light and low-powered aeroplanes have been produced.—C. G. G.]

Aerial Societies :—

Aero Club von Deutschland, Blumeshof 17, Berlin W.35. (Major von Tschudi is the motive power. This is the only club which is especially of a representative character. Official review : *Luftweg.*)

Deutscher Luftfahrt-Verband (formerly Deutscher Luftfahrer-Verband), Bohnhofstrasse 35I, Bremen. (This club consists of about 35 different associations all over Germany. Before the War, the "Deutscher Luftfahrer-Verband" was chiefly interested in ballooning and was the representative of Germany in the Fédération Aéronautique Internationale. Since 1922, the Deutscher Luftfahrt-Verband has been central organisation of which almost all the other German organisations are members so as to obtain a great central organisation. The Aero Club von Deutschland and the Wissenschaftliche Gesellschaft fur Luftfahrt are not members. The General Manager is Admiral Herr. Official review : *Luftfahrt.*)

Wissenschaftliche Gesellschaft fur Luftfahrt. Blumeshof 17, Berlin W.35. (Purely scientific institution, corresponding to the Royal Aeronautical Society of England. Hptm. a. D. Krupp is the director. Official review : *Z Flu.*)

Deutscher Modell-und-Segelflugverband (formerly the Deutscher Modell-und Gleitflugvereine). Its objects are model-flying, gliding and soaring clubs organisation. Official review : *Flugsport.*

Automobil-und Flugtechnische Gesellschaft. Janarstr. 24, Wilmersdorf, Berlin. (Official review : *Der Motorwagen*, of scientific nature, this club is more particularly devoted to motoring. Motive power : Civ. Ing. Conrad).

Bund Deutscher Flieger, Gildehofstr. 15, Essen-Ruhr. Particularly devoted to ex-pilots, ex-observers. Official review : *Illustrierte Flugwoche.*

Deutscher Flugsport Verband, Mommsenstr. 2, Charlottenburg, Berlin. No activity during 1922. Official review : *Automobil und Flugverkehr.*

Deutscher Verkehrsbund, Abteilung Luftfahrtpersonal, Engelufer 21, Berlin S.O.16. In the nature of a Trades Union, this club is an association of the members of all air lines, pilots, mechanics, etc. It exists solely in the interests of such persons, for pay, insurance, legal advice, etc. Official review : *Luft-und-Kraftfahrt.*

Verein Flug und Hafen, Blumeshof 17, Berlin W 35. Society devoted to the interests of aerodromes and aerial transport companies. Official review : *Luftweg.*

Verband Deutscher Luftfahrzeugintustrieller Blumeshof 17, Berlin, W.35. (The society of German aircraft firms.)

Aerial Journals :—

Zeitschrift fur Flugtechnik und Motorluftschiffahrt (*Z.F.M.*), Munchen, Gluchstrasse 8. Technical journal published by the W.G.L. (Wissenschaftliche Gesellschaft fur Luftfahrt), and therefore especially of scientific character. Organ of the W.G.L.

Illustrierte Flugwoche, Leipzig, Schmidt Ruhlstr. 56. Semi-technical and political. Organ of the Bund Deutscher Flieger.

Flugsport, Frankfurt-am-Main, Bahnhofsplatz 8. Semi-technical. Before the War, the leading German aeronautical paper. Organ of the Deutscher Modell-und Segelflug-verband.

Der Luftweg, Berlin W.35, Blumenshof 17. Edited now by the Aero Club von Deutschland. Of informatorial character. Organ of the Aero Club von Deutschland and Verein Flug und Hefen.

Der Motorwagen, Berlin W.10, Genthinerstr. 39. Technical review, devoted to motoring and aviation. Organ of the A.T.G. (Automobil und Flugtechnische Gesellschaft).

Automobil und Flugverkehr, Charlottenburg, Uhlandstr. 184. Semi-technical. Of propagandist value for aviation. Organ of the Deutscher Flugsport Verband.

Motor, Berlin W.35, Lutzowstr. 102/4. Semi-technical. The representative of the German industry.

Luftfahrt, Berlin W.9, Linkstr. 38. Organ of the Deutscher Luftfahrt-Verband. Semi-technical.

Illustrierte Motor-Zeitung, Munchen, Blumenstr. 3. The only Bavarian paper dealing with aviation. Of technical character and propagandist value.

Luft und Kraftfahrt, Berlin-Johannisthal, Sternplatz 4. Organ of the Deutscher Verkehrsbund, Abteilung Luftfahrt. Personal. Corresponding to the purposes of this organisation.

Nachrichten fur Luftfahrer, Wilhelmstrasse 72, Berlin, W.8. Semi-official information paper. Review of the leading international aeronautical papers.

AIR TRANSPORT COMPANIES.

The following lines operated during 1923 :—

Terminal Stations.	Intermediate Stations.	Operating Company.
1. Berlin—München.	Dessau—Leipzig. Nürnberg—Fürth.	Junkers-Luftverkehr.
2. Berlin—Königsberg.	Danzig.	Deutsche Aero-Lloyd A.G. and Osteuropa-Union*.
3. Königsberg—Reval.	Memel—Riga.	Osteuropa Union.*
4. Berlin—London.	Hamburg, Bremen.	Deutsche Aero-Lloyd A.G. and Daimler Hire.
5. Genf (Geneva)—Munchen.	Zürich.	Transeuropa-Union.**
6. München—Budapest.	Wien.	Transeuropa-Union.**
7. Königsberg—Moskau.	Smolensk.	Deutsch-Russische. Luftverkehrs-Gesellschaft.
8. Hamburg—Kopenhagen.		Dänische Luftfahrtgesellschaft and Deutsche Aero-Lloyd A.G.
9. London—Köln.	Brüssel.	Instone Air Line.

*Die Osteuropa-Union consists of an amalgamation of the following :—Junkers-Luftverkehr, Berlin, Petrograd, Moskau, Lettländische Luftverkehrs A.G. Riga, Aero-Lloyd A.G. Berlin und Warschau, Danziger Luftpost G.m.b.H., Danzig Aeronaut. A.G. Reval.

**Die Transeuropa-Union consists of an amalgamation of the following :—Junkers Luftverkehr, Berlin, Rumpler Luftverkehr A.G. München, Oesterreichischer Luftverkehr A.G. Wien, Aero-Express R.-T. Budapest, Ad Astra Aero A.G. Zürich.

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GERMANY—*continued.*

GERMAN AERODROMES.

Augsburg.	1 Hangar, 60 × 45 m.
Braunschweig.	2 Hangars, 66-73 × 45 m.
	1 Repair Hangar, 76.04 × 36.07 m.
Bremen.	1 Hangar, 25 × 13 × 5 m.
Breslau (Gandau).	1 Repair Hangar.
	2 Hangars, 63 × 20 m.
Danzig (Langfuhr).	1 Hangar.
Dresden	
Elbing Wansau.	1 Hangar.
Friedrichshafen a.B.	1 Airship Hangar, 240 × 43 × 28 m.
	1 Airship Hangar I, 192 × 35 × 28 m.
	1 Airship Hangar II, 240 × 40 × 35 m.
Friedrichshagen b. Berlin.	1 Hangar, 75 × 13 m.
Hamburg (Fuhlsbüttel).	
Fürth (Nürnberg).	2 Hangars, 66 × 22 m. and 73 × 45 m.
Gelsenkirchen.	2 Hangars.
Hannover.	4 Hangars, 70 × 80 × 40 m.
Johannisthal.	4 Hangars.
Konigsberg	
Konstanz	
Leipzig (Mockau).	1 Hangar, 30 × 14 m.
Magdeburg.	1 Hangar for 7 machines.
Munchen (Schleissheim).	3 Hangars for International Air Lines.
Schneidemuhl (West).	1 Hangar.
Staaken b. Spandau.	1 Airship Hangar, 220 × 30 m.
	1 Hangar, 25 × 60 m.
	1 Hangar, 20 × 64 m.
	1 Hangar, 72 × 36 m.
	1 Hangar, 37 × 26 m.
	1 Hangar, 40 × 66 m.
Stettin	
Stralsund.	1 Hangar, 50 × 21 m.
	1 Hangar, 30 × 21 m.
Stuttgart	
Teltow.	5 Hangars, 50 × 30 m.
Travemünde.	2 Hangars, 20 × 20 m.
	1 Hangar, 20 × 64 m.
Wangeroog	
Warnemünde	
(Seaplane Station).	1 Hangar, 30 × 40 m.
(Aeroplane Station).	1 Hangar, 60 × 20 m.
	1 Hangar, 41 × 22 m.
Westerland	
Zeesen (Koelngswusterhausen).	1 Hangar (for giant aeroplanes), 75 × 60 m.
	1 Hangar, 54 × 30 m.
	1 Hangar, 85 × 20 m.
	1 Hangar, 64 × 21 m.
	1 Hangar, 64 × 15 m.

GREECE.

MILITARY AVIATION.

Owing to the revolution in Greece and the chaos consequent on the exile of the late King Constantine, nothing very definite can be learned of the present state of aviation in the Greek Army since its defeat by the Turks.

A certain number of aeroplanes have been bought from the Gloucestershire Aircraft Co., Ltd., and from the Aircraft Disposal Co., Ltd. The former are of the "Mars" type, with Siddeley "Jaguar" engines, the latter D.H.9s.

THE R.H.N.A.S.

The Royal Hellenic Naval Air Service had an aeroplane centre at Phaleron, where the training of the R.H.N.A.S. proceeded under Captain H. C. J. A. R. West, late R.N. and late Wing Commander R.A.F., of the British Naval Mission in Greece, under Admiral Kelly.

THE R.H.A.A.F.

The Air Force in connection with the Hellenic Army had during 1921 about 100 flying officers.

Aerodromes.—Tatoi (near Athens); Goudi (near Athens); Lamia; Larissa; Jannina; Sedes (near Salonika); Drama; Suda (Crete).

Landing places for hydro aeroplanes are at Phalerum (near Athens) and Suda (Crete).

COMMERCIAL AVIATION.

Nothing has been done to develop civilian flying.

GUATEMALA.

The Republic of Guatemala has recently had a bloodless revolution, the Army siding with the Revolutionaries. At the time the Army possessed a few French aeroplanes, but these were not used in the Revolution, as no Guatemalans were able to fly and the French pilots were engaged as instructors and not as fighting men.

HOLLAND.

Aeronautical Society :—

Royal Dutch Aero Club. Offices: Mauritskade 39, The Hague. Telegraphic address: Aero Club, The Hague. Affiliated to the Fédération Aéronautique Internationale.

Aeronautical Journal :—

Het Vliegveld (monthly). The official organ of the Royal Dutch Aero Club. Address: Heerengracht 450, Amsterdam.

Civil Air Company :—

Koninklijke Luchtvaart Maatschappij Voor Nederland en Kolonien. Date of Incorp.: 1920. Offices: 13, Heerengracht, The Hague. Manager: A. Plesman. Services operated: Amsterdam—London, Amsterdam—Paris. This company is a member of the International Air Traffic Association.

GOVERNMENT POLICY IN MATTERS CONCERNING AERONAUTICS.

Air-Section at the Department of Public Works. (Afdeeling Luchtvaart van het Ministerie van Waterstaat). Controller: Dr. J. F. Schönfeld; Assistant: E. Th. De Veer.

Advisory Committee concerning Aeronautics. Advises the Air-Section and has sub-committees for 1° air legislation, 2° technical affairs, and 3° ground organisation and aerial transport.

GOVERNMENT STUDY SERVICE FOR AERIAL LOCOMOTION.

Marinewerf, Amsterdam. Director: Dr. Ir. E. B. Wolff. Material-testing and engine laboratory, chemical laboratory.

CHIEF AVIATION CENTRES IN HOLLAND.

[For the following information the Editor is indebted to the Air Section of the Department of Public Works.]

CHIEF AVIATION CENTRES IN HOLLAND.

A. Aerodromes and Seaplane Stations available for *international* civil aviation (Custom Stations).

I. **Aerodromes.**

Schiphol (9 kms. S.W. of Amsterdam). Civil customs and military aerodrome. Hangars, petrol, oil, minor repairs, medical assistance, restaurant, wireless, wind-indicator. Night-landing arrangements on request.

Waalhaven (6 kms. S.S.W. of Rotterdam). Civil customs municipal aerodrome. Hangars, petrol, oil, minor repairs. medical assistance, restaurant, wireless, wind-indicator, Night-landing arrangements on request.

II. **Seaplane Stations.**

Schellingwoude (1.5 kms. E. of Amsterdam). Naval and civil seaplane station. Hangar, petrol, oil, minor repairs, wind-indicator. Night-landing arrangements on request.

Waalhaven. Civil and Customs municipal seaplane station situated to the immediate N. of Waalhaven aerodrome, 5 kms. S.S.W. of the centre of Rotterdam. Two mooring buoys and a landing stage at the S.E. end of the alighting area. Petrol and oil and minor repair facilities are available at the aerodrome adjoining. There are no sheds or slipways.

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HOLLAND—*continued.*

Soesterberg Aerodrome. The chief experimental aerodrome of the Dutch Military Air Service.

B. Aerodromes and Seaplane Stations open to civil aviation *in Holland*, not open to international traffic.

I. **Aerodromes.**

Soesterberg (11 kms. N.E. of Utrecht). Military and civil aerodrome. Hangars, petrol, oil, all repairs, medical assistance, wireless, wind-indicator, night-landing arrangements on request. Customs examination only by obtaining permission from the Commandant prior to arrival. (Commandant, Maj. J. H. Hardenberg.)

De Kooy (5 kms. S.S.E. of Helder). Naval and civil aerodrome. Hangars, petrol, oil, all repairs, medical assistance, wind-indicator, night-landing arrangements. No Customs facilities.

II. **Seaplane Stations.**

De Mok (Southern point of the isle of Texel, 4 kms. N. of Helder). Naval and civil seaplane station. Hangars, petrol, oil, repairs, medical assistance, wireless, wind-indicator. Customs examination only by obtaining permission from the Commandant prior to arrival.

C. Aerodromes and Seaplane Stations available for use by civil aircraft *in emergency only*.

I. **Aerodromes.**

Gilze-Rijen (between the towns of Breda and Tilbuug, 10 kms. E. of Breda). Military landing ground Hangars, wind-indicator.

Oldebroek (18 kms. S.W. of Zwolle). Artillery camp. Hangars, medical assistance, wind-indicator

Flushing (1.5 kms. N.E. of Flushing town). Naval flying ground for land machines.

II. **Seaplane Stations.**

Veere (6.5 kms. N.E. of Middleburg). Naval seaplane station. Hangars, petrol, oil, repairs.

D. Emergency Landing Grounds.

Bussum. Situated on meadowland, west of Bussum, in the parish of Hilversum.

Rijssen. This landing ground comprises two separate sites, situated about 75 metres apart (N.W-S.E.), in the "De Mord" parish meadowland.

Wissekerke. Situated on North Beveland island, 2 kms. S. of Wissekerke village. This landing-ground consists of two pieces of meadow land, with clay soil, one for landing in an E.W. direction and the other in a N.S. direction.

Roosendaal. Situated 3½ kms. E.N.E. of Roosendaal, on the south side of the road to Breda. The ground consists of an L-shaped piece of meadow-land with a sandy soil.

Deventer. Situated on meadow-land in the N.E. part of the Tenge or Bergweide, approximately 1½ kms. E. of the Yssel river and 2 kms. E.S.E. of Deventer railway station.

Milligen. Situated on the military drill ground at Milligen, 15 kms. W. of Apeldoorn and 2 kms. E.S.E. of Gardern. Sandy soil covered with heather.

Small landing-grounds, without accommodation or personnel, are available near Leeuwarden, Venlo, Ede, Hellendoorn, Heumen, Mierlo, Wassenaar.

MILITARY AERONAUTICAL INSTITUTIONS.

Army Flying Service (Luchtvaart-Afdeeling, L.A.). Headquarters at Soesterberg.

In command of the Army Flying Service: Major of the General Staff, J. H. Hardenberg.

1st Lieut. Adjt.: W. P. van den Abeelen.

1st Lieut. Adjt. to the Commander: L. A. M. Koppert.

Flying-Officer in General Service: Captain F. A. Van Heijst.

Tactical Officer: Capt. J. J. van Santen.

Engineer, Chief of the Technical Service: Ir. B. Stephan.

Engineers: Ir. B. A. Ingenegeren, Ir. B. Voskuil and J. H. Takens, Engineer-Lieut., R.N.

Chief of the School for Observers: Captain J. C. M. Simon Thomas. 1st Lieut. V. E. Wilmar, 1st Lieut. T. van Weeren.

Chief of the Wireless Service: Lieutenant C Mollinger.

Chief of the Photo-technical Service: 1st Lieutenant J. Sar.

Chief of the Medical Service: Flight-Surgeon J. E. Brouwer, F. A. Reynders, Adjt.

Instructors at the Flying Schools: 1st Flight-Lieut. W. C. J. Versteegh, 1st Flight-Lieut. A. K. Steup, 1st Flight-Lieut. G. A. Koppen, Sergt. V. D. Griend and Sergt. Bakkenes.

NAVAL FLYING SERVICE (Marine Luchtvaart Dienst, M.L.D.).

The Naval Flying Service is a unit under the Admiralty.

Naval Air Stations:—

In Holland:—

De Mok (on Texel): Naval flying station for seaplanes.

De Kooy (near Helder): Naval flying station for land machines. Flying school.

Schellingwoude (near Amsterdam): Naval flying station for hydro-aeroplanes.

Veere (Zeeland): Naval flying station for seaplanes.

Flushing (Zeeland): Naval flying station for land machines.

In the Dutch East Indies:—

Tandjong Priok: Naval flying station for seaplanes.

Soerabaja: Naval flying station for seaplanes, landing field for aeroplanes in course of construction.

Semarang: For seaplanes (temporary station).

AIR TRANSPORT COMPANIES.

(*a*) The Royal Air Transport Company for Holland and Colonies.

Koninklijke Luchtvaart Maatschappij (K.L.M.). Commercial and Postal Air Services. Office: Heerengracht 13, The Hague. Manager: A. Plesman.

(*b*) The Dutch-Indian Company for Aerial Locomotion.

Air lines for commercial purposes in and about the Dutch Indies. Office: Samarang (Java).

Representative: Ir. M. F. Onnen.

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HOLLAND—*continued.*

A Dutch Minesweeper used as an aircraft carrier by the Dutch East Indies Air Service. The aircraft are of war-time design, Dutch-built Brandenburg seaplanes.

DUTCH EAST INDIES.

Landing Grounds :—
Kali Djati (Chief Flying Station).
Andir (near Bandoeng).
Antjol (near Batavia).
Grissee (near Soerabaja).
Seaplane Station :—
Tandjong Priok (near Batavia).

Colonial Army Flying Service.

In command of the Colonial Army Flying Service : Captain of the General Staff J. A. Roukens.
Capt. Adjt. J. C. F. Ohlhardt.
Chief of the Staff : Flight-Capt. W. Leendertz.
Instructors : V. H. Baker, 1st Flight-Lieut. P. ten Zeldam and A. J. M. Koster.
Engineer : Chief of the Technical Service, H. A. Vreeburg.

REPUBLIC OF HONDURAS.

The Republic of Honduras had an Air Force composed of two Bristol "Fighters" (Hispano-Suiza engines) and General Ivan D. Lamb. This officer is a Canadian by birth and served during the War in the R.F.C. and Royal Air Force. After the War he became Director-General of Aviation to the Republic of Honduras, controlling military and civil aviation. He was also chief pilot and engineer-in-chief, and at the end of 1921 was waiting for the Government to engage assistants for him. In 1922 he left Honduras suddenly, owing to some political affair of the kind so frequent in Central America.

The following information has been received during 1923 *through the Department of Overseas Trade* :—

The first aeroplane to be brought to Honduras under a concession granted in April last to Dr. T. C. Pounds, arrived at Amapala in June, 1923, in charge of an American aviator. The machine was assembled at San Lorenzo, and a flight was made to Tegucigalpa, with one passenger, in less than thirty minutes.

The machine is a Lincoln-Standard, fitted with a Hispano-Suiza motor of 180 h.p., and has a carrying capacity, in addition to the pilot, sufficient for two passengers and 450 lbs. of mail.

Apart from exhibition flights over the capital, a preliminary flight has also been made to San Pedro Sula, which occupied one and a half hours, while the return journey, with one passenger, was made in about two and a half hours. The journey from north to south will always occupy longer than from south to north, on account of wind currents, and an altitude of 10,000 ft. is considered necessary to give a margin of safety in crossing mountain ranges en route to and from the north coast.

No definite scale of charges has yet been fixed for passenger traffic, and a contract for carrying mails also requires confirmation.

The concession granted to Dr. Pounds permitted the free importation of aviation material required for his proposed air services and for the free use of national land and timber for the establishment of landing grounds.

The American aviator, Mr. Mayse, who brought the aeroplane to Honduras with a view to starting in partnership with Dr. T. C. Pounds, has since sold this machine to Dean Brothers, proprietors of a motor transport business, of Tegucigalpa, and has returned to the United States in order to obtain a second aeroplane for this firm.

A National School of Aviation has since been established, under the direction of Sr. Luiz Vendetti, an Italian pilot, and details have been published of the course arranged for the training of pilots.

HUNGARY.

(Supplied by the Hungarian Authorities.)

Aviation Associations :—

Magyar Aero Szövetseg (Hungarian Aero Association, IX, Lónyai u. 36, Budapest). President : Count Imre Károlyi. Vice-Presidents : Kálmán Farkas, Béla Krisztinovich, Joseph Bendik and Jenö Kara.

The Association has five subsections :—Propaganda, Education, Literature, Sport and Air Transport.

The work of the Association comprises on the one hand, propaganda activities, and on the other hand, the education of youth. For propaganda purposes, the Association gave numerous lectures.

The Education Section organised, in the Royal Technical University, a pilots' course ; and in the Higher Industrial School, a course of lectures were given on aeroplanes and motor mechanism.

The Sport Section organised two National Model Aeroplane Races.

The number of members of the Association is 3,200. It was founded in 1911.

The Country Sections of the Aero Association are :—Miskolcz, Orosháza, Szeged, Szombathely, Esztergom, Pécs. Müegyetemi Sportrepülök Egyesülete (Society of Sporting Aviators of the Royal Technical University), Budapest. President : Dr. Béla Bresztovszky, Professor of the Royal Technical University. Junior President : Joseph Maier.

The aim of the Society is the development of gliding and aviation. The number of members is 200. Founded 1921.

Aviation Papers :—

Repülés (Aviation). Edited and published by Arpad Lampigh, I, Horthy Miklos ut 15, Budapest. Monthly publication.

Auto (Partly Aeronautical). Edited by Ernö Lindner and István Illes, VII, Vilmos-Csaszar ut 34. Fortnightly publication.

AVIATION AUTHORITIES.

Chief of the Air-traffic Department of the Board of Trade : Karoly Vassel, Director of State Air Traffic. (II, Hunyady Janos ut 1, Budapest.)

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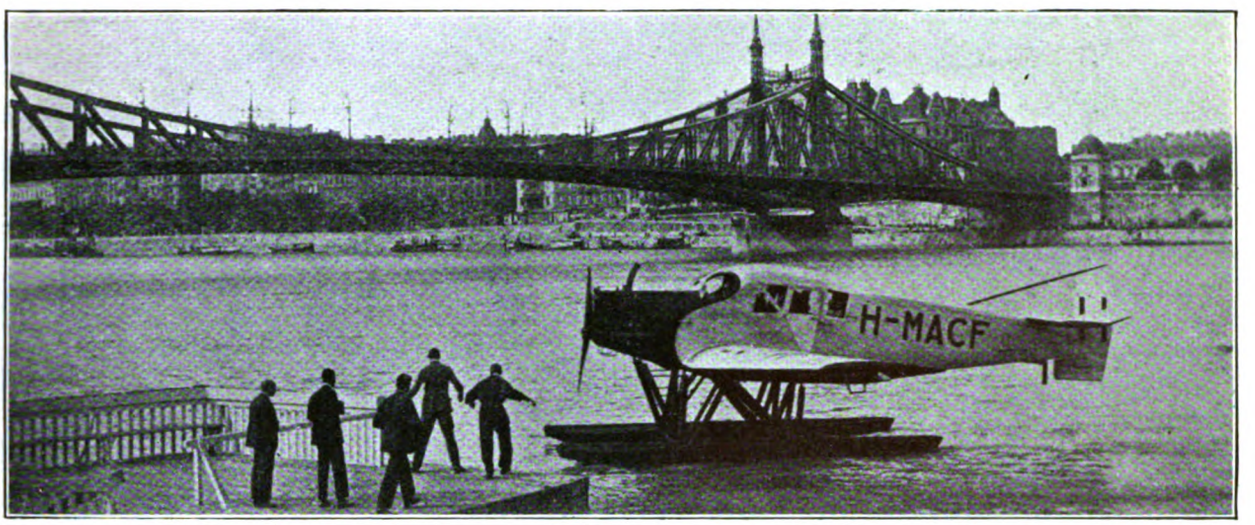

A Junkers Seaplane on the Aero Express service coming to the landing stage by the Franz-Josef Bridge at Budapest.

Deputy and Manager of Traffic Matters : Joseph Bendik, Sub-director; Manager of Legal, Financial, Press and Statistical Matters.

Sub-director : Jenö Kara, Manager of Technical Matters.

Superintendent : Kornél Király.

Aeroplane Factories :—

Neuschloss-Lichtig Aeroplane Factory, Ltd., Budapest-Albertfalva.

Express Works (Aeroplane, Motorcar Bodies, Airscrew and Shipscrew manufacturing), I. Daróczy u 1, Budapest.

Civil Air Transport Companies :—

Hungarian Airtransport Co., Ltd., VII, Erzsébet-Korut 9, Budapest.

Aeroexpress Co., Ltd., Hotel Gellert, Budapest.

Compagnie Franco-Roumaine, IV, Vörösmarty tér 3, Budapest.

Civil Aerodromes :—

Budapest. Waterplane station (on the Danube, in the centre of the city).

Matyasfold (near Budapest). Two hangars and works (9.3 km. from Budapest). The measurements of the aerodrome are : 470 × 630 m.

Miskolcz. 1 hangar. Aerodrome measurements : 500 × 600m.

Szombathely. 3 hangars. Aerodrome measurements : 600 × 1,200 m.

Szeged. 3 hangars. Aerodrome measurements : 400 × 600 m.

HISTORY OF THE YEAR.

Since the removal, in November, 1922, of the flying restrictions there has been systematic work pursued in Hungarian aviation, aiming first of all at organising civil airtransport, and in respect of mechanics at producing new aeroplane models.

Broadly speaking, these plans were carried out, but the poor economic conditions of the country caused very numerous difficulties.

Civil Airtransport.

The Hungarian Airtransport Co., Ltd. (Founded on Nov. 19, 1922). Obtained concessions for the following lines :—Budapest—Vienna, Budapest—Belgrade.

On the Budapest—Vienna line there were from July 30 to October 20 regular daily services with passenger, post and parcel transport. The traffic was maintained with five Dutch manufactured six-seater (F.III mark) Fokker type passenger aeroplanes. The machines are driven by 185 h.p. B.M.W. motors. The aeroplanes were brought to Budapest from Amsterdam by air.

It was not possible to establish the Budapest—Belgrade air line as the Yugoslav Government is, so far, unwilling to grant permission of entry to Hungarian machines.

On the Budapest—Vienna line, 136 journeys were made according to time-table between July 30 and October 20. The machines flew on this line 258 hours and 46 minutes ; carried 296 passengers and parcels totalling a weight of 27,572 kgs ; thus making an average of 2⅛ passengers and 203 kgs. freight per journey.

Besides passengers' luggage, post, newspapers (totalling 100,834) and various goods were carried.

The distance between the two cities is approximately 210 km. Owing to the constant N.W. wind, the journey from Budapest to Vienna required on the average half-an-hour more (2 hours and 9 minutes) than the return journey, when the time required was 1 hour 38 minutes.

In spite of unfavourable weather conditions, it was possible to run the stipulated journeys according to time-table with 100% punctuality.

Apart from the regular Budapest—Vienna journeys, the Company arranged excursion flights and occasional picnics to various points of the country. Thus during the course of the year, together with the regular journeys, 1,671 passengers were carried, 556 ascents were made, the number of traffic hours totalled exactly 500 and the distance covered was 60,000 km.

During the whole of this period there was not a single mishap or motor breakdown.

The Company is composed of a purely Hungarian staff, with Count Frederick Wilczek, President-Director, at its head ; Andor Pal, Director of Traffic, and Dr. Imre Vizlekety, Administrative-Director.

The Aeroexpress, as a member of the Trans-Europa Union, was founded on January 1, 1923.

Obtained concessions for the following lines :—

(*a*) For aeroplanes on the three following routes :—Budapest—Prague, Budapest—Bucharest and Budapest—Agram.

(*b*) For waterplanes :—On the Hungarian section of the Danube, the Budapest—Lake Balaton Line, and for the local traffic of the Lake Balaton surroundings.

Of the above-mentioned routes, the lines with Prague—Agram could not be established hitherto, owing to the seclusive attitude of the respective States. Thus the Company was only able to establish air lines on the Lake Balaton route and on the Budapest—Vienna part of the Danube section.

Between Budapest and Vienna there were 132 journeys planned as from July 15 to September 30, and the distance was covered on 124 occasions. The machines therefore worked 94% according to time-table.

The number of passengers carried was 187 ; parcels, 936 kgs. ; and 39 kgs. of post. Thus making an average of 1.5 passenger and 8 kgs. freight per journey. The distance covered was 31,000 km. during 251 hours.

Between Budapest and Lake Balaton, as well as on Lake Balaton, there were occasional flights between June 29 and October 8. Excursion flights were also made to various points of the country with aeroplanes as well as waterplanes.

During this year's activities the Company accomplished between January, 1923, and October 30, 1923—counting together the regular and occasional flights—a total of 610 ascents and during 428 hours covered 49,729 km., carrying 1,082 passengers and 1,124 kgs. luggage.

During the course of the year one mishap occurred. This, however, happened on an excursion flight and not on the regular Budapest—Vienna journeys.

The traffic was maintained with six-seater Junkers type machines :—3 aeroplanes and 3 waterplanes.

One of the aeroplanes made a longer journey with the Bishop of Szombathely to Rome and back, where the Pope received the Bishop, his secretary and the pilot at an audience and granted to the machine and to the pilot a silver souvenir-plate.

Count Bésán Endre Jankovich, President-Director, and Joseph Maier, Director, are at the head of the Company. The Company employs Hungarian pilots and personnel.

The Compagnie Franco-Roumaine. Maintained regular daily services between Vienna—Budapest and Budapest—Belgrade from February 17, 1923, to September 30, 1923 (the latter only since March 15).

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HUNGARY—*continued.*

Fokker Monoplanes and Passengers at the Hungarian Air Transport Company's station.

On the Budapest and Vienna line, 702 journeys were made with 262 passengers. Altogether, on 1,424 journeys, 743 passengers, 19,189 kgs. goods and 1,881 kgs. post were carried. Thus averaging ½ passenger and 14.8 kgs. freight per journey. 10.2% of the passengers were English, 11.5% Hungarian, 27.7% French, 5.1% Roumanian, 6.5% Yugoslavian, 3.5% German, and the rest were of different nationalities.

The goods transported were as follows :—Wool, silk, cotton goods (cloth, lace, thread), clothes, stockings, hats, fur, decorative feathers, raw leather, sausages, mushroom seed, tea, castor oil, goose liver, leeches, butter, cheese, pastry, snails, conserves, fruit, cigars, cosmetic articles, brass, tin, aluminium, paper goods, electrical fittings, films, books, toys, and ware samples.

Air Regulations.

As for the regulation of the air traffic, the Board of Trade issued a special Order containing the provisions concerning air traffic. The administrative instructions supplementary to the Order are now being elaborated.

Of these, the instructions regarding the training of pilots, the registration and supervision of air vehicles, aerodrome regulations, the territorial division of the sphere of functions of aerodrome authorities, traffic regulations and instructions concerning the attitude to be pursued towards foreign air vehicles have already been published.

Special provisions have been made by the aviation authorities that all precautionary measures should be taken to further the safety of air communication.

ITALY.

Aerial Societies :—

Federazione Aeronautica Nazionale Italiana (F.A.N.I.), Via Tritone 183, Rome.
Aero Club d'Italia, Via Tritone 183, Rome.
Aero Club di Roma, Via Tritone 183, Rome.
Lega Aerea Nazionale, 6, Via della Signora, Milan.
Società Aeronautica Italiana, 4, Via Boccaccio, Milan.
Società Aviazione di Torino, Galleria Nazionale, Turin.
Associazione Aeronautica Partenopea, Aero Club di Napoli, Villa Comunale, Naples.
Federazione Italiana Aeronauti, Via S. Nicolao, Milan
Associazione Nazionale Piloti Aviatori, 21, Piazza Duomo, Milan.
Aero Club di Padova, 41, Via S. Sofia, Padua.
Aero Club Veneto, 41, Via S. Sofia, Padua.
Associazione Italiana d'Aerotecnia (A.I.D.A.), Via del Tritone 183, Rome. The Association Italiana di Aerotecnica (Italia Association of Aerotecnics), affiliated to the Aero Club of Italy, founded in 1920, has for its object the progress of Aeronautical Science and Tecnics. Its Honorary President is General M. Morris ; Acting President, Prof. Ing. A. Anastasi ; and has branches in Rome, Turin, Milan and Naples. It publishes annually its own records in the form of four pamphlets.
Corporazione Nazionale dell'Aeronautica, Via XX Settembre 26, Bologna.
Aero Club delle Marche, Ancona.
Aero Club di Sicilia, Palermo.
Associazione Ligure Aeronautica, Genoa.
Aero Club Emiliano, Bologna.
Associazione Aviatori Comensi, Como.
Sindacato Italiano Porti Aerei, Via Pompeo Magno 5, Rome.

Aerial Journals :—

L'Aerea, Via Sistina 23, Rome 6. Daily Bulletin. L.100 per annum.
La Gazzetta Del Aviazione, 2, Via Valpetrosa, Milan. Weekly. 20 cent.
L'Aviazione, Casella Postale, 93, and Via Tritone, 183, Rome. Weekly. 20 cent.
L'Ala D'Italia, 2, Via Valpetrosa, Milan. Monthly. L.4.
Rendiconti Dell'Istituto Sperimentale Aeronautico, Commissariato d'Aeronautica, Rome. Subscription, L.50 per year.
La Via Azzurra, 50, Santa Lucia, Naples. Monthly. L.3.
Rassegna d'Aeronautica, Stabilimento Poligrafico del Ministero della Guerra, Rome. Monthly. L.5.
Le Vie del Cielo del Mare e della Terra, 24, Via S. Vitale, Bologna. Monthly. L.3.

Official Publications published by the "Direzione Superiore del Genio e Costruzioni Aeronautiche," Rome :—

Rendiconti degli studi ed esperienze. Quarterly.
Notiziario e Note tecniche di Aeronautica. Monthly.
Annuario dell'Aeronautica.

Publications dealing regularly, but not exclusively, with Aviation :

Rivista Del Touring Club D'Italia, Corso d'Italia, 10, Milan. Monthly. L.18 per annum.
La Gazzetta Dello Sport, Corso Porta Nuova, 19, Milan. Daily. 20 cent.
Corriere Italiano, Piazza Poli, Rome. Daily. 10 cent.
Motorismo, Via Chiaia 213, Naples, Monthly. L.1.
Rivista Politico Finanziaria, Corso Umberto 20, Rome. Fortnightly. L.1,50.
Le Vie Del Cielo E Dell'Aria, Genoa. Monthly. L.2.
Italia (Review of the "Associazione Movimento Forestieri), Via Colonna 52, Rome. Monthly. L.10 per annum.
Motori Aero Cicli E Sports, Via Manzoni 31, Milan. Fortnightly. L.2.
L'Auto Industriale, Via Calamatta 2, Rome. Monthly. L.2.

ITALIAN AVIATION.

A Short History.

By Captain Sylvio Scaroni, Air Attaché to the Italian Embassy.

Italian Aviation, which during the War became one of the strongest in the world and wholly superior to that of the enemy, having during the last few months of war almost suppressed any activities on the part of the latter, was left during the post-bellum period in a state of complete neglect owing to the slight consideration given to it by the several succeeding Governments. Large quantities of materials left over were destroyed and all the best and most daring of Italian pilots were lost sight of by reason of the lack of consideration shown them by the authorities and being attracted by other and more interesting private employment.

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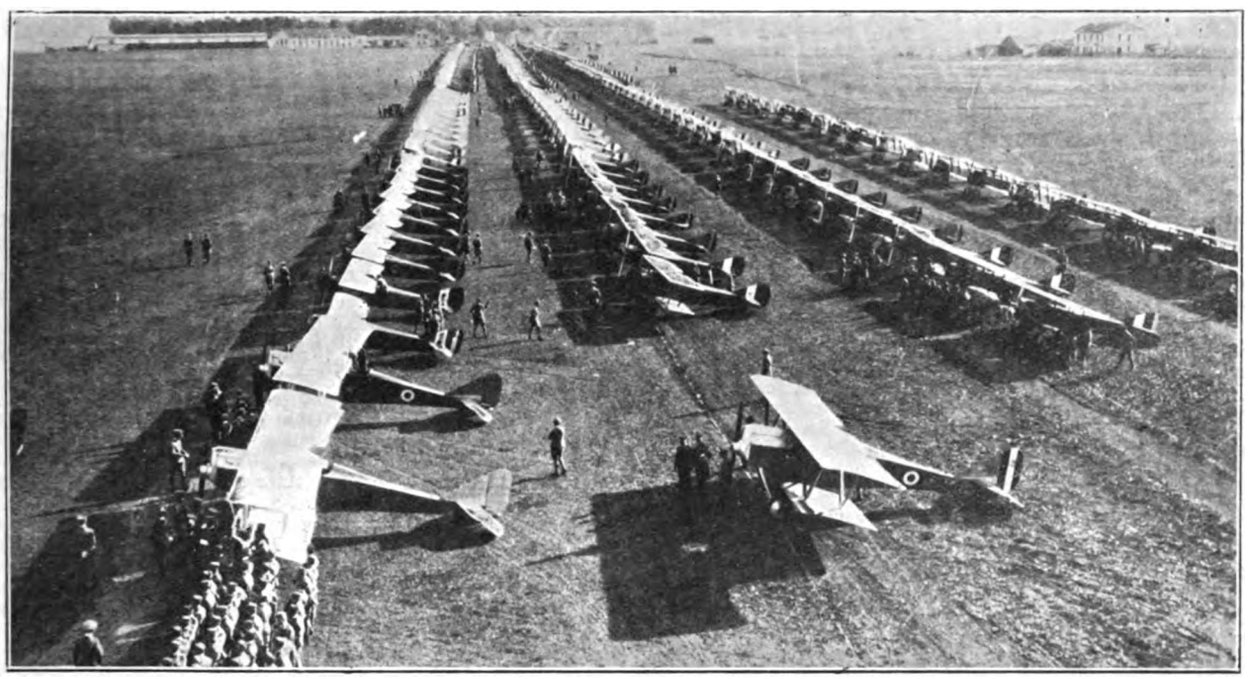
ITALY—*continued.*



Aeroplanes of the Regia Aeronautica in review order.

With the advent of the National Government, this powerful arm of Italy rose again to a new and more vigorous life.

His Excellency Signor Mussolini, convinced of the great importance of Aviation in any future war, disturbed by the knowledge of the development of aeronautics which had taken place and was continuing in neighbouring States, and being himself a keen aviator, undertook, in addition to the other weighty cares of State, the great task of developing and organising the hitherto neglected Aerial Forces of the country.

He called to his aid in this by no means easy task some of the greatest aviators and organisers, amongst whom were the Under-Secretary to the Italian Home Office, H. E. Finzi, who had been one of the seven pilots of the historical expedition on Vienna, H. E. Mercanti, an intrepid pilot and indefatigable organiser, Colonel Moizo, one of the few of the old school of aeronautical officers and ardent aviators who remained at their posts in order to check the wanton dispersion of men and means and to deprecate the state of indifference and neglect in which this powerful means of offence and defence of the country had been left.

The Air Vote was increased nearly tenfold and intense work was immediately begun on the construction of fresh aircraft of the best known types; on repairs to inefficient planes, on improvement of existing aerodromes, airship and seaplane stations, etc., and on the establishment of new ones and of emergency camps along the prearranged aerial routes. At the same time the construction was begun of new experimental aircraft and motors, which would in future be able by their stability and reliability to successfully compete with any of the best and most recent types constructed by foreign countries.

Thus, in less than six months, the Aerial Forces were more than trebled, although considerable losses were incurred owing to the intensification of experimental flying.

In all, 37 Aerodromes, 8 Airship Stations, 16 Seaplane Stations and about 10 Emergency Camps were established.

These important results even now justify the belief that Italian Aviation by this summer will have attained that degree of development and efficiency which will enable Italy to regain the high place she held among the Allied Nations during the great War.

ORGANISATION.

To the "**Commissariato per l'Aeronautica,**" which is under the direction of the Prime Minister, H. E. Mussolini, has been entrusted the Development, Control and Organisation of both Military and Civil Aviation. Dependent on the "Commissariato dell'Aeronautica" are :—

(1) The "**Comando Generale della Regia Aeronautica**" (General Command of Royal Aeronautics) and

(2) The "**Intendenza Generale della R. Aeronautica**" (General Directorate of Royal Aeronautics).

To the first is entrusted the organisation, instruction and discipline of all Military Aviation. It is therefore independent of the land and sea forces.

Drilling and the employment of Aeronautical sections in connection with the said forces during their periodical manœuvres are carried out by arrangement with the Headquarter Staffs concerned.

The ranking of the various Commands under the General Command (Commando Generale) is as follows :—

Comando di Squadra Aerea.—Aerial Fleet Command.
Comando di Divisione Aerea.—Aerial Division Command.
Comando di Stormo.—Group Command.
Comando di Gruppo.—Wing Command.
Comando di Squadriglia o Stazione.—Squadron or Station Command.
Comando di Sezione Aerea.—Flight Command.

A further re-grouping of the tactical units (Squadrigli-Stazioni) is made according to their particular employment.

At present there are :—

Stormi da caccia.—Hunting and Fighting Section.
Stormi da ricognizione tattica.—Tactical Scouting Section.
Stormi da ricognizione strategica.—Strategical Scouting Section.
Stormi da bombardamento diurno.—Day Bombing Section.
Stormi da bombardamento notturno.—Night Bombing Section.
Gruppi di idrovolanti.—Seaplane Group Section.
Gruppi di dirigibili.—Airship Group Section.

Dependent on the "General Command," there are also :—

The "**Accademia Aeronautica**" (Aeronautical Academy), for the training of Officers;

The "**Scuola d'Applicazione**" (Higher Technical School), for the training of specialized Officers in the service of the Italian Aviation; and four "**Centri Depositi**" (Central Depots), for the instruction of troops and for the storing of the material to be kept as a reserve and in case of mobilisation.

The "**Intendenza Generale**" of the Italian Aviation are responsible for :—

(*a*) The construction and repair of all aircraft and distribution to the proper sections;
(*b*) Experimental research and study;
(*c*) The construction of works and buildings; arrangements for the administration of camps and auxiliary services;
(*d*) The administration of the whole personnel of the Royal Aviation;
(*e*) The flying instruction of the personnel destined to the "Squadriglie Militari" (Military Squadrons) and the training of the Reserve.

It promotes and controls the working and use of the existing and future Civil Air Lines.

It devotes itself, in fine, to the study of, and proposals relative to, legislation in aeronautical matters.

The "Intendenza Generale" provides for the above duties by means of three "**Direzioni Superiori**" (Superior Directorates), viz. :—

"**Direzione superiore del Genio e delle Costruzioni Aeronautiche**" (Superior Directorate of Engineering and of Aeronautical Construction).

"**Direzione Superiore del Traffico Aereo**" Superior Directorate of Aerial Traffic).

"**Direzione Superiore dei Servizi Amministrativi e del Personale**" (Superior Directorate of Administrative and Personnel Service).

Each of the above Direzioni Superiori is subdivided into various Sections and Central and Territorial Offices.

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ITALY—*continued.*

The construction of materials is entrusted to private establishments working under the supervision and control of engineers of the Italian Aviation.

To these private establishments is also entrusted the study of new aircraft and aviation motors on data supplied by the Direzione Generale del Genio Aeronautico.

This Directorate provides by means of its own Experimental Section for the inspection and trial of materials to be employed and for the necessary studies in order to determine the characteristics of the land and sea crafts proposed.

Trials of new types of land machines are made at the Experimental Aerodrome of Montecelio and for seaplanes at the Seaplane Station of Vigna di Valle, both under the direct supervision of the Directorate of Engineering and Aeronautical Construction. It has also been arranged for a fuller development of the Experimental Section, with a view to entrusting to it the construction and study of new types of aircraft and motors which, if proved satisfactory, can then be sent to private firms for production in quantity.

The Construction of Dirigibles, of Helicopters, and any other craft of a secret character are carried out by the **Stabilimento delle Costruzioni Aeronautiche** (Royal Establishment for Aeronautical Constructions).

CIVIL AVIATION.

All aeronautical initiative work and activity in Civil Aviation is dealt with by the **Intendenza Generale dell'Aeronatica** (General Directorate of Aeronautics), which provides for these operations through the Superior Directorate of Aerial Traffic.

AVIATION SCHOOLS.

There are at present in Italy the following Flying Schools :—

Soc. An. Gabardini Cameri (Novara), the oldest, largest and most modern Italian Flying School. Founded before the War, it supplied Italian Aviation during that period with over 1,500 pilots, and even to-day provides for the instructions of a large number of would-be aviators who are taught in aeroplanes of their own property and construction, of exceptional strength and constructed entirely in steel.

The following have recently been opened :—

S.I.B.A. (Societa Italiana Brevetti Antoni) di Coltanto (Pisa).

Scuola d'Aviazione Breda annessa ai Cantieri di Costruzioni Aeronautiche Breda di Sesto S. Giovanni (Milano).

Scuola d'Aviazione del la Societa Anonima Aeronautica Mecanica Airone con Sede a Ponte S. Pietro (Bergamo).

Scuolo d'Aviazione Macchi annessa ai Cantieri della S.A. di costruzioni Aeronautiche Macchi di Varese (Milano).

There are various centres for the training of pilots on leave. This training is in the hands of the **Corporazione Nazionale d'Aeronautica** (National Corporation of Aeronautics), whose headquarters are in Venti Settembre No. 26, Rome.

The said Corporation, which is the organ of all civil aviation personnel, has established various schools for the preliminary instruction of pilots and motoring engineers at Rome, Padova, Genova, Verona, Cagliari and Barletta.

AERIAL ROUTES.

Two great lines have recently been planned to link up with the great international routes. One from Turin to Sarzana, Rome, Naples and Bari, ending at Brindisi, whence it can be extended to the East by means of seaplanes.

The other line starting from Turin to Milan, Brescia, Padova and ending at Udine ; whence it can be extended to Vienna and Belgrade.

Connecting with these lines are various other minor lines.

None of the above routes is actually completed, as the "Intendenza Generale" (General Directorate) has hitherto had to devote its entire energy to the establishment and organisation of Aerodromes, Airship Stations, Seaplane Stations, etc., all along the proposed routes, so as to ensure the safety of the aircraft and the comfort of passengers, and thus giving the working of same to Companies having large financial means and possessing aircraft which can compete by reason of their design and stability with any in use in Italy or other foreign countries.

It is hoped that during 1924 the following air routes will be opened :—

A seaplane line along the course of the River Po from Turin to Trieste.

A mixed line of aeroplanes and seaplanes from Rome to Ancona and Zara.

A seaplane line from Brindisi to Constantinople.

AIR STATIONS AND AERODROMES.

Up to the end of 1923 the following Air Stations, together with their auxiliary services, have been established :—

37 Aerodromes :—Mirafiori e Venaria Reale (Torino), **Alessandria, Novi Ligure, Malpensa, Lonate Pozzuolo, Torretta, C. Costa** (all in the province of Milano), **Ghedi** (Brescia), **Piacenza, Parma, Boscomantico** (Verona), **Gardolo** (Trento), **Bolzano** (Trento), **Arcade** (Treviso), **Aviano** (Treviso), **Udine, Gorizia, Zaule, Pola, Bologna, Ravenna, Pisa, Centocelle** (Roma), **Ciampino** (Roma), **Sessa Aurunca, Capua, Napoli, Benevento, Venosa, Foggia, Gioia del Colle, Brindisi, Grottaglie** (Taranto), **Catania, Borore e Cagliari** (Sardegna).

8 Airship Stations :—Campalto (Venezia), **Jesi** (Ancona), **Ciampino** (Roma), **Pompei, Grottaglie** (Taranto), **Augusta** (Siracusa), **Pontedera, Pisa.**

16 Seaplane Stations :—Sesto Calende (Milano), **Schirana** (Milano), **Desenzano** (Garda), **Ancona, Varano, Brindisi, Taranto, Siracusa, Napoli, Vigna di Valle** (Roma), **Orbetello, Livorno, Spezia, Terranova Pausania, Zara, Pola.**

5 Emergency Landing Grounds :—Borgotaro, Bariano, Campiglia, Albegna, Sarzana.

By June of 1924 it was expected that the following would be in working order :—

Aerodromes :—Cuneo, Civitavecchia, Foligno, Loreto (Ancona), **Nettuno.**

Seaplane Stations :—Garda, Sant'Antioco (Sardegna).

Emergency Landing Grounds :—Terni, Albenga.

AERONAUTICAL ASSOCIATIONS.

Corporazione Nazionale Aeronautica, Via XX Settembre 23, Roma, con Segreterie provinciale in tutte le principali città.

Federazione Aeronautica Nazionale Italiana (F.A.N.I.), Via Tritone 183, Roma.

Aero Club d'Italia, Via Tritone 183, Roma.

Aero Club di Roma, Via Tritone 183, Roma.

Lega Aerea Nazionale, 6, Via della Signora, Milano.

Società Aeronautica Italiana, 4, Via Boccaccio, Milano.

Società Aviazione di Torino, Galleria Nazionale, Torino.

Associazione Aeronautica Partenopea, Aero Club di Napoli, Villa Comunale, Napoli.

Federazione Italiana Aeronauti, Via S. Nicolao, Milano.

Associazione Nazionale Piloti Aviatori, 21, Piazza Duomo, Milano.

Aero Club di Padova, 41, Via S. Sofia, Padova.

Aero Club Veneto, 41, Via S. Sofia, Padova.

Associazione Italiana d'Aerotecnia (A.I.D.A.), 10, Lungotevere Michelangelo, Roma.

Group of Italian Pilots, with His Excellency Signor Finzi.

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ITALY—*continued.*

AERONAUTICS IN ITALY.

By Alighiero Baciocchi.

[The following information may be regarded as supplementary to that so kindly supplied by the Italian Embassy.—C. G. G.]

FOREWORD.

The Italian Air Force, which during the year 1923 was made into a force independent of the Army and Navy, is still in the initial stages of its re-organisation owing to the period of inactivity from 1919 to 1922, when the Government's inert air policy allowed the whole Service to practically go to ruin.

In contrast to the long period of decadence, however, when not only were the machines demobilised, but what is worse, the moral of the personnel deteriorated, is the activity during the last year in the field of Aviation. This is largely due to the wise, clearsighted policy of the Government, which saw that the Italian Air Service would never be in a position to compete with other countries without radical changes being made in the organization.

The Air Force constitutes the third armed force of the country. It is comprised of 50 squadrons in full working order and practically all new machines. The personnel, encouraged by better conditions and animated by the highest spirit of patriotism and emulation, has been recalled to the Colours. The services have been re-organised and the "**Intendenza Generale dell' Aeronautica**" composed of technical experts is actively participating in the restoration of aeronautics with a vast programme full of promise for the future.

Although all which was predicted by some optimists a year ago has not been done, yet with legitimate pride can the stride forward of the last year be reviewed.

IL COMMISSARIATO DI AERONAUTICA.

According to a decree passed in August, 1923, the following modifications were made in the "Commissariato di Aeronautica":

The "Commissariato di Aeronautica" (Commissariat of Aeronautics) comprises the "Comando General della Regia Aeronautica" (General Command) and the "Intendenza Generale dell'Aeronautica."

The General Command includes the following offices:—Technical, Material, Management, Instruction, Operation and Information, Personnel, Recruiting and Movement.

Until the final definite numerical composition is arrived at, under the jurisdiction of the General Command, will fall the following:—

3 Divisional Commands.
6 Wings.
9 Groups of Aeroplanes.
4 Groups of Seaplanes.
1 Group of Airships.
1 R. Accademia Aeronautica (cadet college).
1 Specialists' Department.
4 Depots.

The "**Intendenza Generale dell'Aeronautica**" will be composed of:—

The High Directorate of Engineering and Aircraft Construction (Direzione del Genio e delle Costruzioni Aeronautiche).

The High Directorate of Instruction and Traffic.

The High Directorate of the Administrative Services and of the Personnel.

The above Directorates will, in their turn, be divided into Directorates and Sections, as follows:—

High Command of Engineering and Aircraft Construction:—The Directorate of Survey and Building Sections. Six Survey and Building Sections. The Stabilimento di Costruzioni Aeronautiche (Aircraft Factory). The Turin Section. The Milan Section. The Aeroplane Factory Section. The Seaplane Factory Section. The Section for the production of engines. The Armoury Section. The Electric and Radiotelephonic Section. The Photography Section. The Mobilisation and Statistical Section. The Experimental Section. The Experimental Station at Montecelio (Rome). The Experimental Seaplane Station at Vigna di Valle (Rome). The Experimental Armoury School "Furbara" (Rome). The Airship Station at Ciampino (Rome). The Squadron of the Commissariato.

The High Directorate of Instruction and Traffic:—The Traffic Office. The Instruction Office. The Aerological Section.

The High Directorate of the Administrative Services and of the Personnel:—The Administrative Department. The Pay Office. The Book-keeping Department.

AERONAUTICAL AUTHORITIES.

The following officials hold the chief offices in Italian Aeronautics:—

S. E. On. Benito Mussolini, Italian Premier, Alto Commissario dell'Aeronautica, Palazzo Viminale, Rome.

S. E. On. Aldo Finzi, Vice-Commissario dell'Aeronautica, Palazzo Viminale, Rome.

S. E. Gr. Uff. Arturo Mercanti, Intendente Generale dell'Aeronautica, Pallazzo Viminale, Rome.

S. E. Ten. Generale Pier Ruggero Piccio, Commandante Generale della Regia Aeronautica, Pallazzo Viminale, Rome.

Comandante Eugenio Casagrande Conte di Villaviera, Ispettore Generale dell'Aeronautica, Palazzo Viminale, Rome.

Gr. Uff. Avv. Ludovico Censi, Capo Gabinetto del Commissariato d'Aeronautica, Palazzo Viminale, Rome.

Colonnello Guido Guidoni, Direttore della Direzione Superiore del Genio e delle Costruzioni Aeronautiche, Viale Giulio Cesare, 2, Rome.

Generale Antonio Falcolini, Direttore della Direzione Superiore del Personale e dei Servizi Amministrativi, Palazzo Viminale, Rome.

Ing. Nobile, Direttore dello Stabilimento di Costruzioni Aeronautiche, Viale Giulio Cesare, 2 Rome.

COMPOSITION OF THE REGIA AERONAUTICA.

Comando Generale della Regia Aeronautica:—Air Officer Commanding: Lieut. Gen. Pier Ruggero Piccio.

Comando Stormo da Ricognizione (Rome).
(Reconnaissance Group Command.)

No. 1 Wing (Centocelle):—Depot of the Group, Parma. Wing H.Q., Malpensa. No. 27 Squadron (SVA), Centocelle. No. 121 Squadron (R2), Centocelle. No. 131 Squadron (R2), Capodichino. No. 38 Squadron (R2), Pisa. No. 25 Squadron (R2), Pisa.

No. 4 Wing (Mirafiori):—No. X Squadron (Ansaldo 300.4), Mirafiori. No. 56 Squadron (SVA), Mirafiori. No. 39 Squadron (R2), Mirafiori. No. 31 Squadron (Ansaldo 300.4), Mirafiori.

No. 15 Wing (Bologna):—No. 32 Squadron (SVA), Padova. No. 87 Squadron (SVA), Padova. No. 113 Squadron (R2), Campoformido. No. 115 Squadron (M.15), Bologna.

Comando Stormo da Caccia (Brescia).
(Pursuit Aeroplane Group.)

No. 13 Wing (Cinisello):—Depot of the Group, Ghedi. Wing H.Q., Ghedi. No. 78 Squadron (Spad 16), Venice. No. 83 Squadron (H.D.3), Venice. No. X Squadron (H.D.3), Aviano.

No. 23 Group (Cinisello):—No. 91 Squadron (Spad), Cinisello. No. 71 Squadron (Spad), Cinisello.

No. 6 Group (Aviano):—No. 79 Squadron (H.D.3), Aviano. No. 81 Squadron (H.D.3), Aviano. No. 76 Squadron (Spad 7), Campoformido.

Comando Stormo da Bombardamento (Milan).
(Bombing Group.)

No. Y Squadron (Spad 13), Mirafiori. No. Z Squadron (Spad 13), Mirafiori.

No. 6 Wing (Malpensa):—Depot of the Group, Malpensa. Wing H.Q., Malpensa. No. 1 Squadron (BR), Mirafiori. No. 8 Squadron (Ca.3), Malpensa. No. 13 Squadron (Ca.3), Malpensa.

Colonie (Colonial Aeronautics).

Aircraft Equipment Stores, Mellaha. No. 89 Squadron (SVA), Mellaha. No. 104 Squadron (SVA), Bengasi. No. 12 Squadron (Ca.3), Mellaha. No. z Squadron (Ca.3), Bengasi.

Comando Scuole Militari Aviazioni (Rome).
(Command of Flying and Training Schools.)

Scuola di Riro Aereo, Cerveteri. Scuola Operai Specialisti, Capua.

Comando Gruppo Dirigibili (Ciampino).
(Airship Group Command.)

Airships F.6, PM, OS, Esperia and N.N., Ciampino.

The Aerodrome at Talledo:—Hangars of the "Societa Italiana Aviazione Civile" S.I.A.C.

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ITALY—*continued.*

The Aerodrome at Centocelle :—Hangars of the Compagnia Nazionale Aeronautica.

Comando Idrovolanti (Rome).
(Seaplane Command.)

No. 1 Wing (Spezia) :—Depot of the Group, Sesto Calende. 1 Station, Spezia. 1 Station, Orbetello. 1 Station, Terranuova Pausania.

No. 2 Wing (Naples) :—1 Station, Naples. 1 Station, Siracusa.

No. 3 Wing (Taranto) :—1 Station, Taranto. 1 Station, Leros (Egeo). 1 Station, Brindisi. 1 Station, Varano.

No. 4 Wing (Pola) :—1 Station, Pola. 1 Station, Venice. 1 Station, Zara. 1 Station, Ancona.

AIR ESTIMATES.

The Estimate of the "Commissariato d'Aeronautica" for the year ending June 30, 1924, totals L.300,000,000. For 1924-1925, L.600,000,000 is asked.

PERSONNEL STRENGTH.

The strength of the Regia Aeronautica is roughly estimated at 750 officers and 10,000 non-commissioned officers and men.

AERIAL ACTIVITY IN 1923.

Flights.—In spite of difficulties of all kinds which have been met with we restorate Italian Aeronautics, the Italian Air Force has progressed satisfactorily during the year under review.

The number of flights effected with a minimum of accidents rose from the 1st March, 1923, up to December 31st, 1923, to about 10,000 hours, which at an average of about 125 miles per hour, constitute a total of 1,250,000 miles, against 93,700 miles of the corresponding period of the year 1922.

Co-operation with other Arms.—The part played by the Air Force at the occupation of Corfu was one of the biggest events of the year. Besides this participation, the aircraft have taken part in several big military manœuvres, and been in co-operation with either the Army or the Navy. Remarkable was the participatión of the Air Force with the best results at the Naval operation in the Sea of Taranto (September-October, 1923), and at the summer manœuvres of the Army in the Sacco Valley, Civitavecchia, Frosinone, Fiuggi and Gorizia.

WORK OF RESTORATION IN 1923.

The main steps taken by the Commissariato d'Aeronautica for the restoration of the Italian Aeronautics may be summarised as follows :—

As to the Personnel :—(*a*) Engagement of short-service officers ; (*b*) Engagement of demobilised non-commissioned officers and men ; (*c*) Transfer to the R.A.F. of officers holding permanent commissions in the Army ; (*d*) Confirmation in rank of short-service officers ; (*e*) Re-engagement of demobilised short-service officers ; (*f*) Engagement of engineers, mechanics, ground staff, etc. ; (*g*) Formation of the "R. Corpo di Equipaggio della R. Aeronautica" for aviation specialists ; (*h*) Institution of yearly prizes to the amount of L.150,000 to be awarded to members of the R.A.F. who give the best results in the maintenance and performance of their equipment ; (*i*) Formation of the "Regia Accademia Aeronautica" (cadet college) ; (*j*) Refresher courses to demobilised pilots.

As to the Aircraft Equipment :—(*a*) Refit of all the machines ; (*b*) Acquisition of new aircraft ; (*c*) Invitation of bids from aircraft constructors on the design of experimental single-engined pursuit machines, multi-engined night bombers, pursuit seaplanes, torpedo carriers, helicopters ; (*d*) Construction of new airships.

Impulse and Encouragement to Aircraft Industry :—(*a*) Offer of a L.5,000,000 prize for a national aero-engine competition ; (*b*) Offer of prizes to the amount of L.1,000,000 to be awarded to Italian firms competing in the French aero-engine competition ; (*c*) Competitions for training, military, touring, commercial and light aeroplanes.

Aerodromes :—(*a*) Repairs to all the aerodromes ; (*b*) Formation of the "Corpo degli Aeroporti" for the establishment and upkeep of all the airharbours, airship and seaplane stations.

Aeronautical Instruction :—(*a*) Course of aerial law at the Genoa University ; (*b*) Course of aeronautical engineering at the R. Politecnico of Naples ; (*c*) Improved course of aeronautical engineering at the R. Politecnico of Turin ; (*d*) Elementary courses of aeronautical engineering, etc., in the principal towns of the country.

Civil Aviation :—(*a*) Offer of a L.1,000,000 prize for a flight across the Atlantic ; (*b*) Offer of a L.100,000 prize for a Rome to Tripoli flight ; (*c*) Initiation of plans for the installation of aerial communications with the Orient, and of the air service Ancona—Zara and Turin—Trieste ; (*d*) Completion of the map of Italy for air navigation purposes.

AERIAL NAVIGATION COMPANIES.

The following is the list of the Companies already formed for air navigation which have already obtained from the Government the necessary permit to carry on flight :—

Compagnia Nazionale Aeronautica, Ltd. (formerly "Cooperativa Nazionale Aeronautica"). Established 1920. Laid up capital : L.1,100,000. Aerodromodi Montecelio. The most important company of Italian Civil Aeronautics devoted to the organisation and exploitation of flying fields, aeronautical instruction, flying school, pilots' training, joy-riding, aerial photography, aerial advertising.

Societa' Idrovolanti Alta Italia, Ltd. (S.I.A.I.). Issued capital : L.2,000,000. Sesto Calende (Milan). This firm is the builder of the well-known "Savoia" seaplanes, but it is also devoted to the exploitation of air lines, etc.

Societa' Anonima Gabardini Per L'Incremento Dell'Aviazione. Issued capital : L.2,000,000. Aerodrome di Cameri (Novara), devoted to the construction of the Gabardini's aeroplanes, to the aeronautical instructions and pilots' training.

Compagnia Di Navigazione Aerea, Ltd. Established 1921. Issued capital : L.1,300,000. Via Aurora 45, Rome. Devoted to the exploitation of national and international air lines with aeroplanes, hydroplanes and airships.

Societa' Aeronautica Meccanica "Airone," Ltd. Established 1920. Issued capital : L.1,500,000. Ponte S. Pietro (Bergamo). Devoted to the construction of aeroplanes and to the aeronautical instruction and pilots' training.

Societa' Italiana Sviluppo Aviazione, Ltd. (S.I.S.A.). Established 1921. Issued capital : L.1,000,000. Porto Rose (Trieste). Devoted to the exploitation of aerial lines, to the aeronautical instructions, pilots' training, etc.

Societa' Italiana Brevetti Antoni, Ltd. Established 1921. Issued capital : L.805,200. Piazza dell'Olio 1, Florence. Devoted to the construction of the Antoni's aeroplanes, exploitation of aerial lines, aeronautical instruction, etc.

Cantiere Aeronautico Breda, Sesto San Giovanni (Milan). Flying school and pilots' training.

Societa' Italiana Aviazione Civile, Ltd. Established 1921. Issued capital : L.300,000. Via Monte Napoleone 28, Milan. Devoted to the exploitation of air lines, aeronautical instruction, pilots' training, etc.

Societa' Anonima Rilievi Aerofotogrammetrici (S.A.R.A.), Ltd. Established 1922. Via Francesco Negri II, Rome 12. Devoted to the aerial photography and to the construction of the "Nistri's Aerial Cameras."

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JAPAN.

[**Note.**—*The following notes were contributed for the* 1923 *edition of "All the World's Aircraft" by Mr. N. Katoh (Yokohama). As no communication has been received from him since the earthquake in* 1923, *it is to be feared that he was among the victims of that cataclysm.*

The Japanese Embassy has ignored all the communications addressed to it, in common with other nations, requesting information for "All the World's Aircraft," though strangely enough the Japanese Services are among the largest purchasers of this book. Consequently, what follows after Mr. Katoh's notes may be regarded as more or less accurate, even though unofficial.—C. G. G.]

AERIAL SOCIETY :—

Imperial Aerial Society. (Teikoku-Hiko-Kyokai). 1 Chome: Yurakucho, Marunouchi, Tokio.

Aero Journals :—

Hiko Kwai (The Aeronautical World.) 2 Chome, Honhatchobori, Kyobashi-Ku, Tokio. A Monthly Magazine. Subscription, Y9 per annum.

FLYING GROUNDS :—

Tokorozawa, Saitama Prefecture. Army Aerodrome, Army Flying School, Balloon Battalion, Army Aviation Works, Airship Hangars, etc.

Kagamigahara, Gifu Prefecture. Army Aerodrome, First and Second Battalions.

Shimoshidzu, Chiba Prefecture. Army Aerodrome, Army Flying Branch School (Scouting Dept.).

Yokaichi, Shiga Prefecture. Army Aerodrome, Third Battalion.

Tachiarai, Fukuoka Prefecture. Army Aerodrome, Fourth Battalion.

Akenohara, Miye Prefecture. Army Aerodrome, Army Flying Branch School (Shooting Dept.).

Phyong-Yang, Korea. Army Aerodrome. Sixth Battalion.

Appama, near Yokosuka. Navy Air Service, Naval Aerial Station, Navy Flying School, Navy Balloon Squadron, Airship Hangars, etc.

Sasebo, Nagasaki Prefecture. Navy Flying Squadron.

Kasumigaura, Ibaraki Prefecture. Navy Flying Squadron, Navy Land Machines Flying School, Airship Hangars, etc.

Ojima, Gunma Prefecture. Civilian Aerodrome, Midzuta Flying School, Japan Aeroplane Works & Co., Aviation Dept. of the Imp. Aerial Society, etc.

Tsudanuma, Chiba Prefecture. Civilian Aerodrome, Itoh Aeroplane Works, Itoh Flying School.

Samukawa, Chiba Prefecture. Civilian Aerodrome, Shirato Flying School.

Susaki, Tokio. Civilian Aerodrome, Oguri Flying School.

Akabane, near Tokio. Civilian Aerodrome.

Haneda, near Tokio. Civilian Aerodrome, Nippon Flying School.

Taihoku, Formosa. Aerial Police Dept. of Formosa Government.

Heito, Formosa. Aerial Police Dept of Formosa Government.

(And various minor aerodromes.)

A Gloucestershire "Sparrowhawk," one of the standard machines of the Japanese Navy.

THE ARMY AIR SERVICE.

Chief of the Army Air Service : Lieut. Gen. I. Inoue.

Assistant-Chief and Director of the Army Flying School : Major-Gen. H. Arikawa.

First Battalion Commander : Col. T. Ozawa.
Second Battalion Commander : Col. K. Hosaki.
Third Battalion Commander : Lieut.-Col. G. Goto.
Fourth Battalion Commander : Lieut.-Col. S. Seki.
Fifth Battalion Commander : Lieut.-Col Y. Sakurai.
Sixth Battalion Commander : Lieut.-Col. S. Masuda.

The Army Air Service consists of six battalions (18 squadrons) for the present. Those are located as follows :—First Battalion, Kagamigahara, Gifu Prefecture ; Second Battalion, Kagamigahara, Gifu Prefecture ; Third Battalion, Yokkaichi, Miye Prefecture ; Fourth Battalion, Tachiarai, Fukuoka Prefecture ; Fifth Battalion, Tatekawa, near Tokio ; Sixth Battalion, Phyong-yeng, Korea.

One balloon battalion is stationed at Tokorozawa.

THE ARMY FLYING SCHOOL.

The Army Flying School was divided into four sections, i.e., (*a*) Piloting Department, (*b*) Engineering Department, (*c*) Scouting Department, (*d*) Aerial Shooting and Bombing Department. (*a*) and (*b*) are located at Tokorozawa Aerodrome, (*c*) is at Shimoslidzu Aerodrome, and (*d*) is at Akenohara Aerodrome.

Japanese Naval N.C.O. Pilots.

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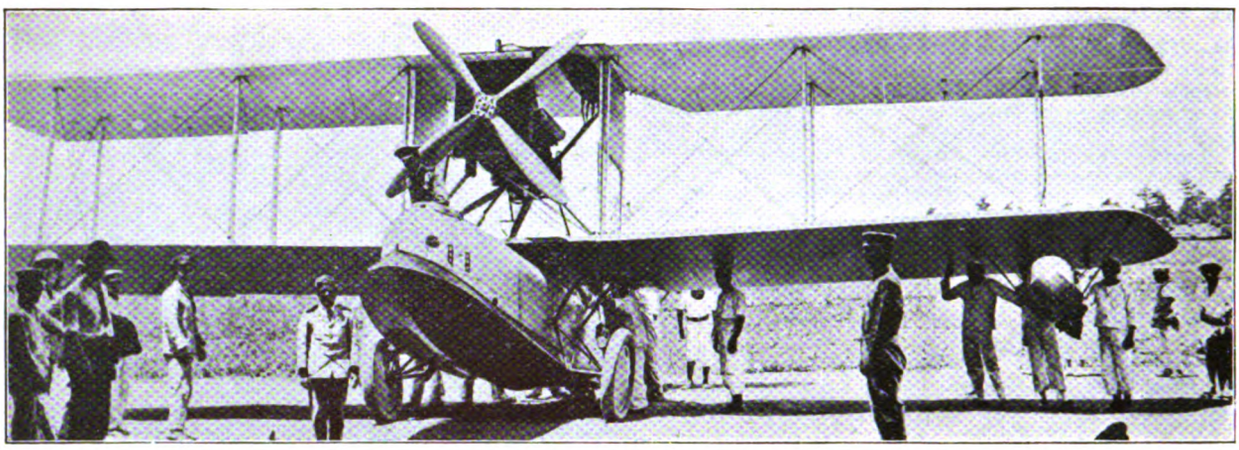
JAPAN—*continued.*



A Supermarine Amphibian with the Japanese Navy.

TYPES OF AEROPLANES.

(*a*) Training :—Type AI (Nieuport biplane, 23 sq. m.), 80 h.p. Le Rhône. Type AII (Nieuport biplane, 18 sq. m.), 80 h.p. Le Rhône. Type AIII (Nieuport biplane, 15 sq. m.), 120 h.p. Le Rhône.

(*b*) General Purpose :—Type BI (Salmson biplane, S.A.L. 2A2) 230 h.p. Salmson.

(*c*) Fighting :—Type CI (Spad biplane), 220 h.p. Hispano-Suiza. Type CII (Spad Herbemont biplane), 300 h.p. Hispano-Suiza. Type CIII (Nieuport 29c.1. biplane), 300 h.p. Hispano-Suiza.

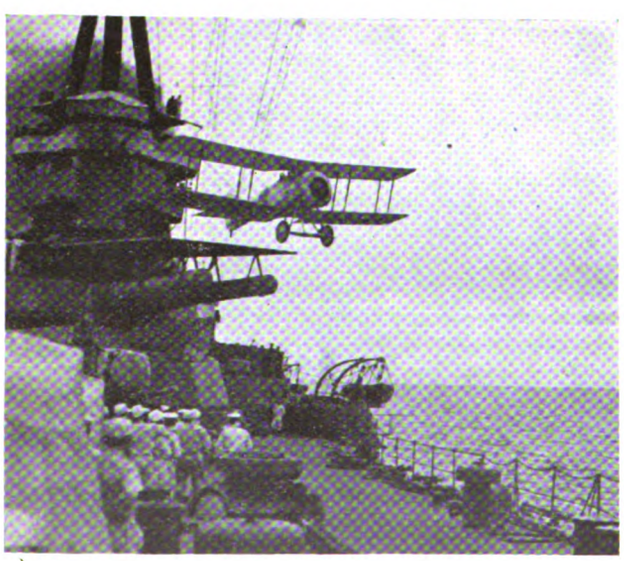
(*d*) Night Bombing :—Type DI (Farman twin biplane, F50), 230 h.p. Salmson (2). Type DII (Farman twin biplane, F60), 230 h.p. Salmson (2).

(*e*) Twin-engined Training :—Type EI (Caudron twin biplane, G4), 80 h.p. Le Rhône (2).

(*f*) Other :—Junkers monoplane.

Almost all of the aeroplanes now used in this country are of our own make, with their home materials. The Army's Aeroplane Works are located at Tokorozawa Aerodrome, and the Military Arsenal at Tokio and Nagoya.

The following several civilian manufacturers also have been supplying military aeroplanes to the Army Air Service :—1. Japan Aeroplane Works & Co. ("A" class and "C" class of aeroplanes). 2. Kawasaki Dock Yard (Salmson aero-engines and "B" class machines). 3. Mitsubishi Naienki Co., Ltd. (Hispano-Suiza aero-engines). 4. Tokio Gas and Electric Engineering Co., Ltd. (Le Rhône aero-engines).



A Japanese Naval Pilot flying a "Sparrowhawk" off the turret of a warship.

THE NAVY AIR SERVICE.

Chief of Yokosuka Naval Air Force : Rear-Admiral T. Tajiri.

Chief of Sasebo Naval Air Force : Captain Fukuoka.

There are two forces (17 squadrons) at present, besides three fleet air squadrons and one balloon squadron. The latter has been settled at Oppama, near Yokosuka Naval Port.

Last year, one of S.S. type airships, imported from England, which has been successful in several long distance flights with Japanese officers, at last exploded by atmospheric pressure, on July 10th, 1922.

An Astra airship was recently imported from France, and this ship's details are as follows :—Length, 80 m. Dia., max. 18 m. Height, 22 m. Capacity, 10,700 cu. m. Total weight, 11.77 tons. Persons, 7. Speed, 150 kts. Tank capacity, 10 hours. Climbing, 3,000 m. Engine, Sunbeam, 300 h.p. (2).

Two more S.S. type airships now building at the Imperial Navy Yokosuka Dock Yard. They will be completed in the middle of this summer.

NAVY FLYING SCHOOL.

The Navy Flying School has been settled at Kasumigaura, near Lake Kasumigaura, Ibaraki Prefecture. It will be the largest of its kind in the Orient, and there are many hangars of modern type, workshops and all other equipment. Therefore, land and seaplanes can start and land at any time. All naval airmen who were trained at this place are instructed on the British system.

AEROPLANE CARRIERS.

(*a*) "Wakamiya Maru," 760 tons, 15 aeroplanes ?
(*b*) "Hosho," 9,500 tons, 30 aeroplanes ?

These two ships had special squadrons each on board, and "Hosho" belonging first battle-fleet and "Wakamiya Maru" the second battle-fleet.

The battleships "Akagi" and "Amagi," which are to be converted into aeroplane carriers, as a result of the Washington Conference, will be known hereafter under their new names, "Taigei" and "Chogei," respectively.

It has been reported that the bulk of Japan's aircraft carriers were destroyed in the recent earthquake disaster. The exact extent of the damage is not known, but a recent official announcement from Japan states that the battle-cruiser "Amagi," which was being converted into an aircraft-carrier under the Washington Treaty, was seriously damaged and that she was to be replaced by the former battleship "Kaga."

The fate of the "Hosho," Japan's only commissioned modern aircraft-carrier, is as yet unknown.

The replacement of the "Amagi" is interesting in that it is the first instance of action being taken under a clause of the Washington Treaty which allows that in case of loss or accidental destruction of capital ships or aircraft-carriers they may be replaced immediately by new construction, subject to the tonnage limits, and in conformity with other provisions of the Treaty.

The "Kaga" was launched at Kobe, on Nov. 17, 1921, and is 700 ft. long with a beam of 100 ft. Her displacement as a battleship would have been 40,100 tons, but as an aircraft-carrier this figure will be smaller.

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JAPAN—*continued.*

TYPES OF AEROPLANES.

(*a*) Training :—Avro 504K and Avro 504L. Supermarine "Channel." Sopwith "Cuckoo." Oshoshiki (Naval Yokosuka Dock Yard type, fitted with Hispano-Suiza engine, tractor float two-seater biplane).

(*b*) Ship-Scouts and Fighting :—Parnall "Panther," Gloucestershire "Sparrowhawk," and Navy 1921 type (which Mitsubishi Naienki Co., Ltd., build, fitted with own make 300 h.p. Hispano-Suiza. No. 1 is single-seat and No. 2 is two seater).

(*c*) Torpedo Carrier :—Blackburn "Swift" and Navy 1922 type (also this machine is built by Mitsubishi, fitted with Napier "Lion," 450 h.p., or Hispano-Suiza 300 h.p. This is a single-seat tractor triplane).

(*d*) Shooting Observation :—Vickers "Viking" and Supermarine "Seal."

(*e*) Patrol :—F-5 Flying-Boat.

(*f*) Others :—D.H.9, Martinsyde, S.E.5, etc.

More than half of the machines now used by the Navy Air Service are home-made by the Imperial Navy Yokosuka Dock Yard and by the Imperial Navy Kure Dock Yard. Also several civil manufacturers have supplied military planes by official specification.

THE BRITISH AVIATION MISSION TO JAPAN.

The following is a precis of the lecture on the work of the British Aviation Mission to the Imperial Japanese Navy which was read by Col. The Master of Sempill to the Royal Aeronautical Society.

The paper described in fair detail the work carried on by the Mission, and gave an excellent idea of the organisation of the Japanese Naval Air Service. It also included some interesting technical data concerning the behaviour of aircraft engines and materials under Japanese conditions.

The paper by itself would occupy some 15 pages of this book and if illustrated with a reasonably comprehensive selection of the pictures which illustrated it, something like 20 pages, and it is therefore impossible here to do more than to extract from it a few of the more interesting points, and to recommend those who wish for a more complete information to consult the original paper when it is published in the Journal of the Society.

Concerning the Mission itself and its constitution, the most striking characteristic was the very great strength of the personnel on the Technical side. Those who are acquainted with the personality of Col. Sempill will not be surprised at this feature, which incidentally may be held to account for the very excellent results which were attained during the course of the Mission's work as marked by the small number of accidents and the excellent behaviour of aeroplanes and engines in service.

The Central Training Station at Kasumigaura consists of a large aerodrome which can be extended from its present area of 700 acres to over double that area when necessary, lying close to the shores of a lagoon some thirty miles long by three to four miles wide. The aerodrome is excellently equipped with sheds, workshops and quarters, and on the shore of the lagoon and connected with the aerodrome by an excellent road there is a seaplane station. From the lantern slides of this station which were exhibited it would appear that Kasumigaura has an equipment which could not be equalled by any British air station, the R.A.E. excepted.

At this station all preliminary training both of officers and men in flying and technical work was carried out. Preliminary flying training was on Avros on the Gosport system. It was found that there was little difference between the time taken by Japanese pupils to pass the Gosport course and that taken by British pupils. The general average ability of pilots is high, but the proportion of abnormally good pilots is less than in this country and there is a tendency to indecisiveness on the part of the Japanese when thrown into an entirely unexpected situation. The virtue of courage is developed to the highest extent and the Japanese will go to any length to carry our orders.

A mechanical sense has scarcely developed among the Japanese. They are often oblivious to disquietening noises in engines, but training and practical experience is beginning to have its effect. Technical officers were found to be very keen, but over-immersed in theory and inclined to leave all practical matters to their petty officers and men. Here again training and practical example has produced its effect.

The men are keen and hard working—even to the extent of foregoing leave in order to finish a job on which they are engaged. With training they make excellent mechanics.

The machines used in the Japanese Naval Air Service were all of well-known types, and gave results in service up to—if not better than—the average. The "Sparrowhawk" with B.R.II engine is particularly singled out as "the most successful scout training machine so far." Troubles were experienced with the damp but were not serious. No structural failures occurred in the air, and no fires resulted from any crash. Engine failures were very few and mostly confined to the Le Rhône engines used on the Avros. It was found necessary to fit special spinners to the rotary engines in the winter to prevent over-cooling and blocking of the crankshaft with ice. It was also found desirable to lower the compression ratio of the Napier "Lion" engines to 5/1, as the machines with these engines were usually operated at low altitudes. Wooden airscrews made in this country gave a good deal of trouble, particularly in summer. Leitner-Watts steel airscrews performed extremely well and gave no trouble.

Japan has an enormous variety of indigenous forest trees, which have not yet received the study they deserve as possible aircraft material. Japanese timbers, generally speaking, are remarkably resistant to splitting or decay, and the soft timbers seem superior to European or American equivalents in expansion or contraction with change of moisture content.

Experience with dope in Japan seems conclusively to confirm the superior stability of nitro-cellulose as compared to cellulose acetate dope. A certain amount of dope is manufactured in Japan, but it is not yet up to British standards.

Lacquer was found useful for the protection of steel struts and wires. It is however somewhat heavy and inclined to chip. Experiments with lacquer applied direct to the wood of airscrews have not been altogether satisfactory, but it is thought that a combination of fabric and lacquer will give better results.

There are oil wells in Japan, and a light aviation spirit is produced. It has a low aromatic content—about equal to the American spirit. Benzol is obtainable, but cannot be relied upon to be sufficiently free from sulphur. It is not considered that native supplies of aviation spirit can keep pace with the demand, and aviation petrol to B.E.S.A. specification is imported from Sumatra and Borneo.

Castor oil is produced from Japanese beans, but American oil is imported for aviation purposes. It is not up to B.E.S.A. standard. Mineral oil is obtained from Japanese wells, but no composite oil such as is needed for aero-engines is produced. Oil is imported from Britain.

Japan possesses an Aeronautical Research Committee, founded in 1916, which is attached to the University of Tokio. The committee's Aeronautical Institute with laboratories and wind-tunnel was destroyed in the recent earthquake. The same fate befel the wind-tunnel at the Naval Air Service Laboratory at Tokio. The Military Air Service possesses the only remaining wind-tunnel at Tokorazawa. The value of research work is very fully appreciated in Japan, and progress in this department has been remarkable.

Five companies in Japan are engaged in building aeroplanes or seaplanes, and in addition a small number of aircraft are constructed in Naval Dockyards and Military Arsenals. British assistance has been given by Short Bros., who instructed the Naval Aircraft Factory at Yokosuka and a private firm in the construction of F.5 flying-boats, and by part of the design staff of the late Sopwith firm who were employed by the Mitsubishi Aircraft Company and who have produced single-seat fighters, two-seat reconnaissance machines and a torpedo-carrying triplane. Avro 504K and 504L (float type) are also built in Japan.

The 300 h.p. Hispano-Suiza engine is built under license by the Mitsubishi Company, and Le Rhône engines are also in production. Negotiations for the building of other types of engine under license are in hand. Salmson engines are built by the Army.

A policy of enlightening the population as to the value of the country's defences is pursued in Japan. Naval Air Stations are open to visitors on one day per week and every town or village in the vicinity sends its quota of visitors of all ages on the appointed day. Even flying-off practises from the decks of ships are nearly always viewed by a limited number of the public and officers are specially detailed to give lectures on flying throughout the country.

JAPANESE AIRCRAFT CARRIERS.

(From Jane's "All The World's Fighting Ships.")

The following are the aircraft-carrying ships owned by Japan :—

AMAGI and AKAGI.

Designed as battle-cruisers, but are to be converted into aircraft carriers, as a result of the Washington Treaty. They are reported to be re-designed for 33 kts. and carry 50 aeroplanes.

"*Amagi*" *reported lost in earthquake. To be replaced by* "*Kaga.*" *See note on previous page.*

HOSHO.

Authorised under the 1919 Naval Programme, begun in 1920 and launched in Nov., 1922. Is modelled on H.M.S. "Argus." Has unobstructed flying deck, horizontal smoke ducts, and accommodation for 26 aircraft.

Displacement : 9,500 tons.
Guns : 4—4.7 in., 2 A.A.
Speed : 25 kts.
S.H.P. : 30,000.
Fuel : Oil only.

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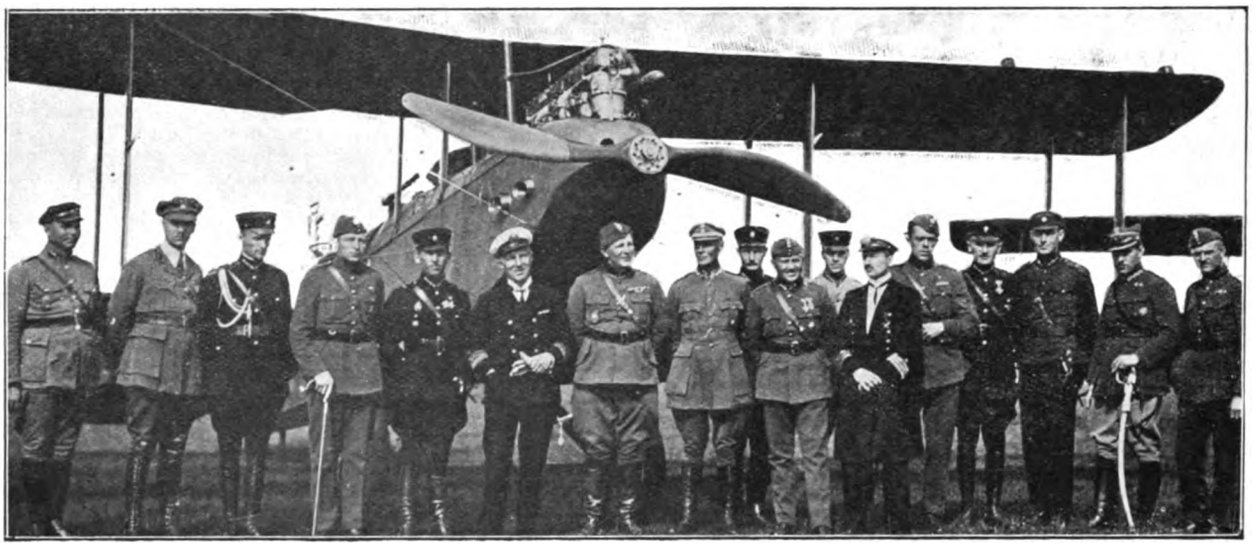
JAPAN—*continued.*

WAKAMIYA.

Was built in 1901 as a naval transport. Has hangars at the foot of each mast and carries 10 seaplanes.

Displacement : 7,600 tons.
Length : 365 ft.
Beam : 48½ ft.
Draught : 19 ft.
Guns : 2—12 pdr.
H.P. : 1,600.
Speed : 9½ kts.

LATVIA.



Officers of the Latvian Flying Corps, with a D.H.9. (Siddeley "Puma" engine) and some foreign visitors.

The Republic of Latvia formed a Flying Corps during the period of fighting in the Baltic Provinces. The organisation of Latvian military aviation was begun in June, 1919.

All aviators are Latvian subjects only. The aeroplanes were gained generally as war-booty during Bermondt's attack.

There exists an aviation school for aviators, observers and aviation mechanics. New aeroplanes are not being built at present.

The aeroplanes operated very successfully during the futile attack by German troops under Bermondt against Riga, and also on the Bolsheviks' front.

[For the following matter one was indebted in 1923 to Mr. C. W. Bisseneck, of the Latvian Legation. Since then no replies have been received to enquiries concerning aviation in Latvia.—C. G. G.]

MILITARY AVIATION.

The Latvian Air Force includes a special Technical Division and is subordinated to the Ministry of Defence.

Apart from fighting units, it possesses a school for pilots, observers, mechanics, military meteorologists and photographers.

The types of aeroplanes used are as follows :—Nieuport, Sopwith, Fokker, Albatros, Halberstadt, Hanoveraner, L.V.G. and S.P.A.

The Technical Division has a repair shop for medium and small repairs. The construction of aeroplanes and repairs on a larger scale are carried out by the Arsenal.

Aerodromes :—Riga-Spilve, Krustpils, Rezekne, Vec-Gulbene

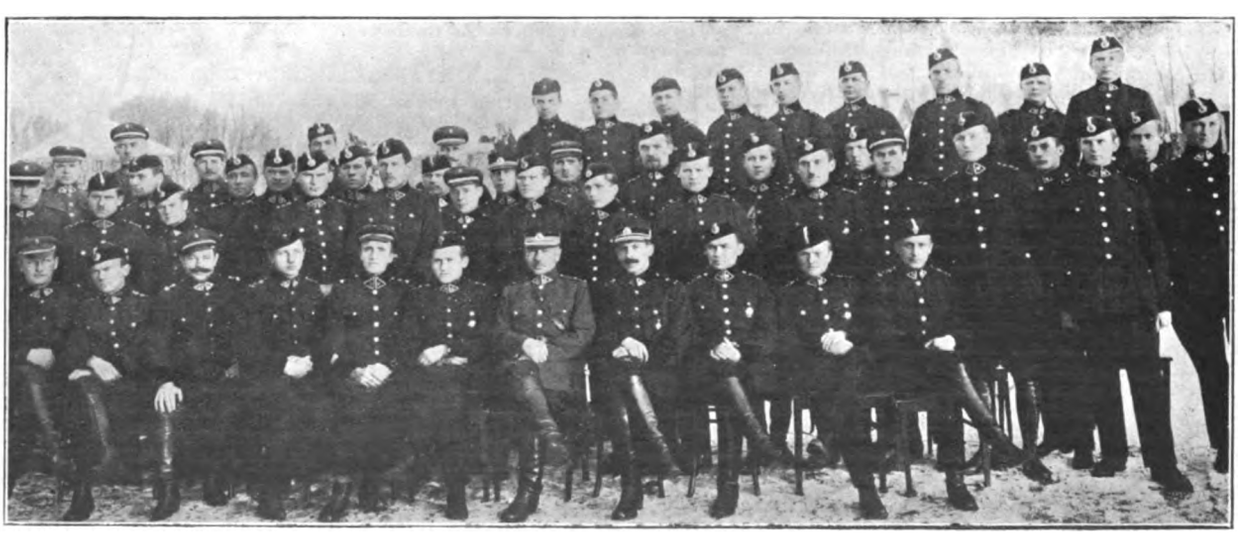
CIVIL AVIATION.

The Latvian airlines, Riga—Kaunas and Riga—Memel, have been running for the last two years. They will be continued in 1923, and the new routes Riga—St. Petersburg and Riga—Moscow will then be added to them.

These lines are served by the Latvian Aerial Transport Company Limited, who use all-metal aeroplanes of the Junkers type, for carrying mails and passengers.

LITHUANIA.

By Courtesy of the Lithuanian Authorities.



A Group of Lithuanian Flying Officers.

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LITHUANIA—*continued.*

THE LITHUANIAN FLYING CORPS.

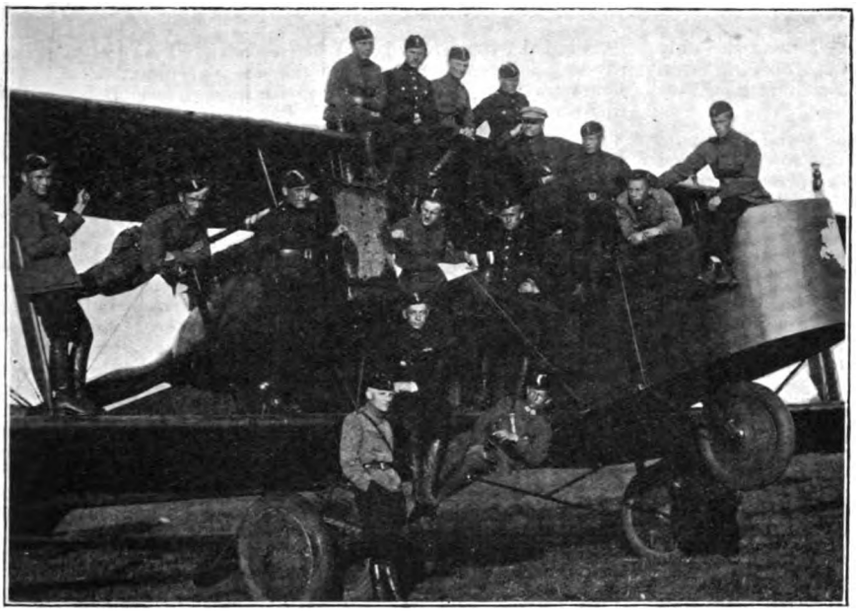
The Lithuanian Flying Corps came into existence in 1919, when the Germans, on evacuating Lithuania, left behind them a number of aeroplanes. At that time the flying personnel consisted for the most part of Germans serving in the Lithuanian forces. But, simultaneously with the acquisition of the first aeroplanes, an aviation school was opened, at which the bulk of Lithuanian pilots and observers were trained. Thus, the flying personnel gradually changed, and by the end of 1919 there were no more Germans left in the Lithuanian Flying Corps.

In 1920, the return of old aviators from the Russian Army, among whom was the very able organizer, Lieut.-General Kraucevicius, who was appointed Chief of the Flying Corps, greatly accelerated the development of the Air Service.

The Lithuanian Flying Corps took an active part in the wars with the Bolsheviks (1919) and the Poles (end of 1920).

Thanks to intensive training, the flying personnel has now attained a high degree of perfection. As an example, may be cited demonstrations of trick flying given on several occasions by a group of scouts simultaneously.

A Group of Officers of the Lithuanian Air Force.



ORGANISATION.

As regards organisation, at the head of the Flying Corps stands the Chief of Aviation, who has his Aviation Staff. He depends directly upon the Commander-in-Chief and the Minister of Defence, and all details of aviation are centralised in his hands. Further, the various divisions of the Flying Corps, such as fighting and training squadrons and parks, are under his direction.

The Park has to provide all the necessary material and to repair all aeroplanes.

Each fighting squadron consists of eight machines.

The training squadron obtains officers from the different Army units, who have to undergo a course of theoretical and practical training.

Civil Aviation has now been organized for the conveyance of mails and passengers between Kaunas and Germany. Riga is also included in this itinerary.

PROGRESS IN 1923.

The Lithuanian Air Force now possesses four squadrons, but this number will be increased in the near future. During the past year many new pilots and observers have been trained. Most of the old machines have been changed for superior types. The aircraft parks have been very active. Machines of one of the latest German war types have been produced and an aeroplane of entirely Lithuanian design has been built. This is described in the Aeroplane Section of this book. The organisation of the Air Force has not been changed.

MEXICO.

Aerial Societies :—
None.

Aerial Journals :—
Tohtli. Organ of the Military Aviation School.
Editor : R. Avila de la Vega. Offices : Avenida Francisco Madero, 1, Mexico City. (Subscription : $3 per annum). Appears monthly.

Aerodromes :—
Valbuena, near Mexico City. (Military Flying School). A dozen thoroughly modern sheds.
San Benito, near Hermosillo. (Military Air Station).

Aviation Works :—
Military Aviation Factory, Valbuena. Director : Sr. Angel de Lasaurain y Osio. Founded, November, 1915.
The factory was equipped with thoroughly modern machinery and produces training and fighting aeroplanes of its own design.
The engine shop produced a Mexican Anzani type engine, called Aztatl, which was used on the later training machines.
The fighting machines were equipped with Hispano-Suiza engines.

Senor Rafael A. O'Neill was appointed the Chief of the Mexican National Air Service about 1920.

Senor Rafael Ponce de Leon was then appointed his Chief of Staff, whose assistants are Pilot Officers Alfonso Virgen, Rafael Montero, Samuel C. Rojas, Guillermo Ponce de Leon and Ascencio Jimenz.

CIVIL AERIAL TRANSPORT.

Two civil aerial transport companies have been formed in Mexico, as the result of American enterprise, and plans have been perfected for the running of air-lines between different provincial cities and the capital.

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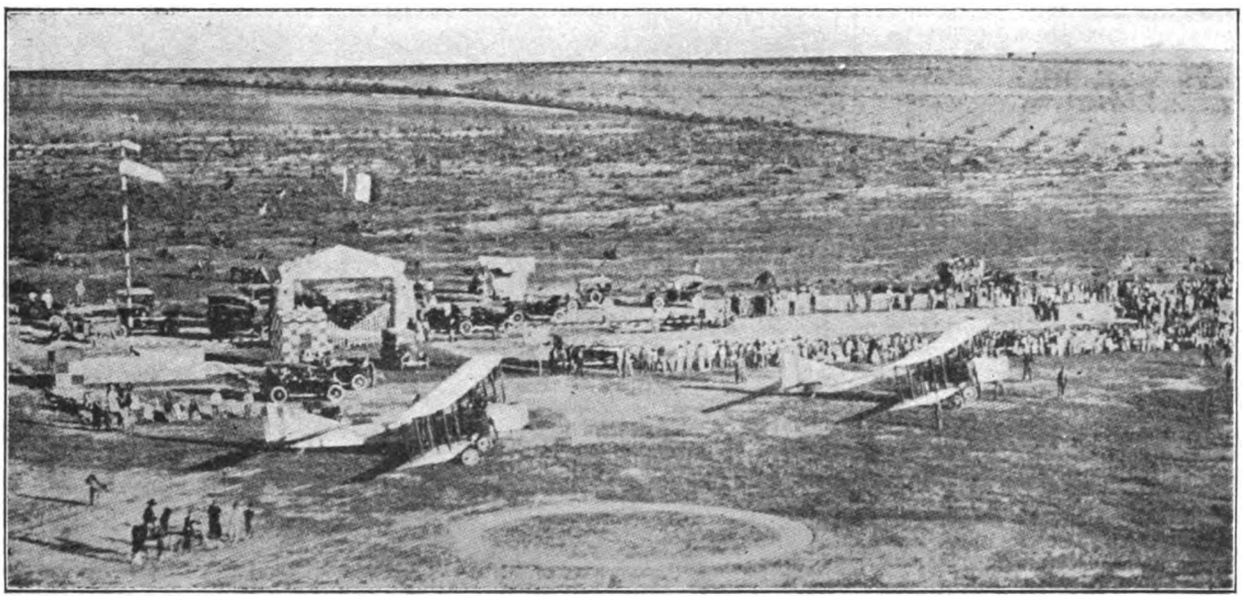
MEXICO—*continued.*



A Mexican Aerodrome on a Gala Day.

The Compania Mexicana de Transportes Aereos is the only one so far to have made an actual start with the opening of an experimental mail and passenger service between Mexico City and Vera Cruz.

Spanish newspapers report that the Mexican Aerial Transport Company (Messrs. Winship and Lawson) have up to date carried out thirty-nine flights between Mexico and Tampico and sixty-eight between Mexico and Tuxpan, not to mention flights to other towns, in particular Ciudad Victoria and Monterrey.

The air lines suffered from the lack of landing grounds, but to remedy this eighteen have now been established by the Company.

The concession granted to the Company by the Ministry of Communications and Public Works obliges the Company to employ a certain proportion of Mexicans after a given period, and with this in view a pilots' school has been opened by the Company at Tampico.

Repair shops, where airscrews and undercarriages are constructed, have also been opened.

An American paper reports that a contract providing for passenger and freight service by aeroplane has been signed by the Minister of War with the representative of the Aerial Navigation Co. of Mexico. This Company is allied with the Colombian German Air Transport Co. (Scadta), which operates along the River Magdalena, Colombia.

The new Mexican company hopes to establish a service between Vera Cruz and Progreso, using Junkers machines and German pilots. The next route to be opened will be from Guadalajara to Mazatlan.

A REVIEW OF MEXICAN AVIATION.

Mexico has for a long time been regarded as a seat of rebellion and insurrection, and it is not generally known that, apart from the distinction of being almost the first country to have employed aeroplanes in actual warfare, they are actually building aeroplanes of original types.

In 1915, at the instigation of Major Albert Salinas, the first Mexican military aviator, an aviation department was created and a military aerodrome and flying school was opened at Valbuena, near Mexico City. Owing to the difficulty of obtaining aircraft from Europe at this time and owing to the then strained relations with the United States, it was decided to begin the construction of national aircraft.

This led to the foundation of the National Aircraft Factory at Valbuena, which began work in November, 1915. The factory was very fully equipped with modern machinery and at first a number of Bleriot and Morane-Saulnier monoplanes were built and fitted with such aero-engines as had survived the revolutionary campaigns or could be obtained elsewhere. A number of tractor biplanes were also built, together with a radial engine of the Anzani type known as the "Aztatl" of 80 h.p.

In 1917 an arrangement was made with the Hispano-Suiza Co., of Barcelona, to build their engines under licence.

In 1918 a single-seater scout known as the "Microplano" and fitted with a 180 h.p. Hispano-Suiza engine was built to the designs of Senor Santarini and later a two-seater training biplane fitted with the 80 h.p. "Aztatl" engine was constructed.

More recently information has been received from the National Aircraft Factory, concerning three of their latest productions.

They are all of the semi-rigid monoplane type and are fitted with the 80 h.p. Le Rhône, the 160 h.p. Mono Gnôme and the 185 h.p. B.M.W. engines. All three types embody the same type of construction, and are to the designs of the Director-General of the Aircraft Factory, Sr. Angel de Lascurain y Osio. These machines are described in the Aeroplane Section of this book.

In general, the aim of the construction has been to eliminate as much as possible all fittings which add weight to the machine and thereby impair its lifting capacity.

In this connection it is interesting to note that the aerodrome at Valbuena, Mexico City, is 2,240 m. (7,347.0 ft.) above sea level and that the performance of these machines was obtained in test flights from this aerodrome.

During the most recent internal trouble in 1924, the Mexican Government obtained a number of American-built D.H.4bs (400 h.p. Liberty engines) from the U.S. Government.

Officers of the Mexican Flying Corps.

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REPUBLIC OF NICARAGUA.

The Republic of Nicaragua is said to own some American-built D.H.4s, with Liberty engines, and four Curtiss training machines. It is said that the Nicaraguan Army and its Air Force is being supplied free by the U.S. Government as compensation for keeping the native Nicaraguans and their turbulent neighbours quiet in the vicinity of the Canal.

NORWAY.

(By Courtesy of the Norwegian Legation and the Norwegian Army and Navy Authorities.)

Aerial Society :—
Norsk Luftseiladsforening (Aero Club of Norway). Affiliated with the Fédération Aéronautique International. Secretary: Lt. B. Gottenborg.
The former societies, The airmen's Union and Norwegian Aero-model Club, were amalgamated with the above-mentioned Aero Club of Norway in March, 1923.

Aerial Journal :—
None.

THE NORWEGIAN ROYAL ARMY FLYING CORPS.

Inspector :—Colonel G. Grüner.
Chief Staff officer : Captain H. C. Norby.

The Army Flying School :—
Officer Commanding : Lieut. A. Tellefsen. Chief Pilot : Lieut. L. Feiring. Instructors : Officers of the Army Flying Corps.

The Army Aeroplane Factory :—
Director : Captain T. Klingenberg. Chief Inspector : Lieut. T. Gulliksen.

Squadrons :—
Sönnefjellske Squadron :—Chief : Captain T. Vetlesen.
Nordenfjellske Squadron :—Chief : Lieut. G. Bull.
Nord-Norges Squadron :—Chief : Lieut. Munthe Dahl.
The Kristiansand Fortifications' Squadron :—Chief : Lieut. R. Andresen.
The Bergen Fortifications' Squadron :—Chief : Lieut. Böe.
The Headquarter of the Inspector is situated in Christiania.

Aerodromes :—
Kjeller Aerodrome is situated near Lilleström (20 kilometres east of Christiana). This place is the centre of all military aeroplane flying. Here are the Flying School, the Army Aeroplane Factory and the Sönnenfjellske Squadron.
Vernes, the aerodrome of Nordenfjellske Squadron, is situated 20 km. east of Trondhjem, near the railway station, Stjördalen.
Ovrevand, the aerodrome of Nord-Norges Squadron, is situated in Salangen, near the town Harstad.
The Fortification Squadrons are stationed at the Seaplane Stations in Kristiansand S. and Bergen.

THE ROYAL NAVAL AIR SERVICE.

Commanding Officer : Captain J. von der Lippe, R.N.
Chief Staff Officer : Commander Kolderup, R.N.

The Naval Flying School :—
Commanding Officer : Commander Th. Thommessen, R.N.
Instructors : Officers of the Royal Naval Air Service, recruited from the Royal Navy.

The Naval Seaplane Factory :—
Director : Lieut. J. Höver, R.N.
Chief Inspector and Test Pilot : Lieut. F. Lützow-Holm, R.N.

Naval Seaplane Stations :—
The Karljohansvern Seaplane Station (Horten) :—C.O. : Lieut. A. W. Hagtvedt, R.N.
The Kristiansand S. Seaplane Station :—C.O. : Lieut. S. Brun, R.N.
The Bergen Seaplane Station :—C.O. : Vacant.
The chief Naval Air Station is by the Royal Dockyard at Horten. Here are the Headquarters, the Naval Flying School, the Naval Seaplane Factory and the Karljohansvern Seaplane Station.

MANUFACTURERS OF AIRCRAFT.

1. The Army Aeroplane Factory, Kjeller Pr. Lilleström.
2. The Naval Seaplane Factory, Horten.

There are no civil factories. Repair work on civil machines is undertaken by those mentioned above.

FLYING SCHOOLS.

1. The Army Flying School, Kjeller Pr. Lilleström.
2. The Naval Flying School, Horten.

There is no civil flying school, but civil pilots may pass the tests for civil certificates on their own machines at the schools mentioned above.

CIVIL AVIATION.

All aviation in Norway is controlled by the Ministry of Defence. As far as civil aviation is concerned, the controlling authority is Fprsvarsdepartementets Luftfartsräd (The Air Traffic Council of the Ministry of Defence). Post address : Box 313, Christiania.
The members of the Council are :—(1) Chairman : Colonel G. Grüner, Inspector of the Army Flying Corps. (2) Captain J. von der Lippe, R.N., C.O. of the Royal Naval Air Service. (3) H. Hauan, Esq.
The Secretary of the Council is Lieut. Hj. Riiser-Larsen, R.N.
Civil machines may land at the above-mentioned aerodromes and seaplane stations.
The aerodromes of Kjeller and Vernes are Custom aerodromes for aeroplanes coming from abroad.
Seaplanes coming from abroad may land at any seaport where there is a Custom House. Such ports lying within prohibited areas are excepted.
Foreign pilots wishing to fly to Norway may obtain all information from the above-mentioned Air Traffic Council.

Sopwith " Babies " belonging to the Royal Naval Air Service, on skis, wheels and floats.

A Norwegian Seaplane by the Naval Aircraft Factory, with Lamblin radiator.

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PERU.

AVIATION IN PERU.

The following article dealing with Peruvian Aviation has been received from Major M. Scott Marsden, who was until recently head of the Government Aircraft and Engine Repair Depot, in charge of all Stores, Spare Parts, etc., and Technical Consultant to the Peruvian Aviation Service.

Service Aviation.

The Peruvian Air Force has its headquarters in Lima (the capital) and is under the command and direction of Senor Don Juan Leguia y Swaine, Capitan de Fregato in the Peruvian Navy and third son of the President.

Commandante Leguia was an officer in the R.A.F. during the War and for his services received the D.F.C. He is the life and soul of the Air Force and it is solely due to his indomitable energy that Peru has an Aviation Service at all.

One could hardly say that the Peruvian Air Force is large, rather let me say that there is formed a small nucleus from which the larger Service will be developed.

Las Palmas.

The main Air Station is situated about 9 miles outside Lima and is called Las Palmas.

This is the main station for the Army Flying Service (Centro Militar). It is commanded by a Lieut.-Colonel, who has under him four Captains, half-a-dozen Lieutenants and about 40 men.

This station is the School and general centre. Instruction is carried out on Avros and Curtisses, then later on Morane Parasols and French Bréguet. Afterwards pilots fly the Morane "Bullet" monocoque, the Spad, the Italian S.V.A. and the Bristol fighters.

The pilot's time after he has qualified is spent in flying over to Cuzco—the old Inca capital—in general cross-country practice, and in taking the weekly wages to the men working on the Pampas, away from ordinary communication.

The whole Service (Military) consists (approximately) of the following machines :—12 Avros, 1 Curtiss, 2 Bréguets, 3 Bristol fighters, 4 Morane "Parasols," 1 Blackburn "Kangaroo," 2 Spads. 1 Morane "Bullet," and 1 S.V.A.

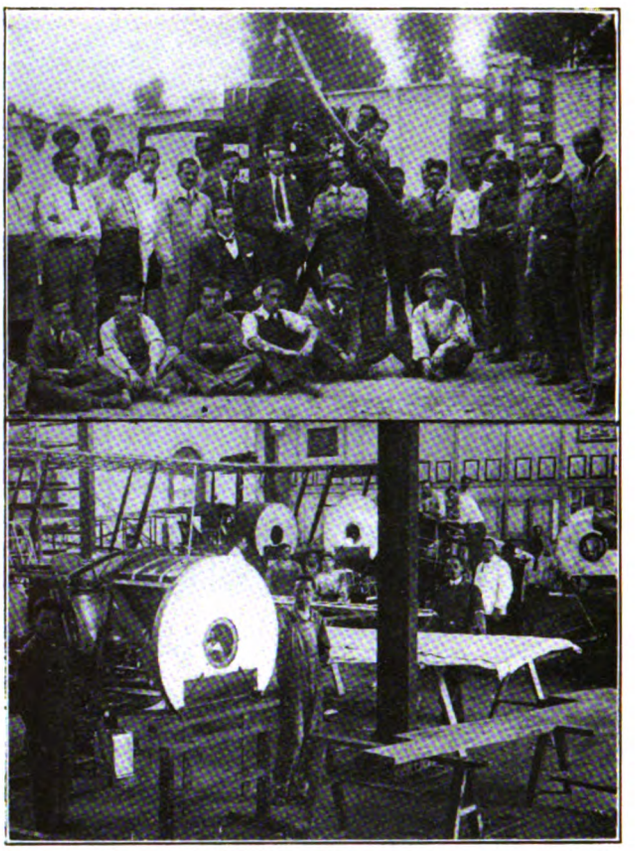
Las Palmas is really the only permanent Air Station in Peru. There is a small aerodrome at Arequipa, but this is hardly used, and in the interior there are one or two landing grounds for machines on cross-country work. Las Palmas itself is only in course of development. Previously the aerodrome was at Maranga—near Callao, the port of Lima.

At Las Palmas about six hangars have been put up and the concrete flooring is now in process of being put down as is a concrete "tarmac" in front of the hangars. Offices are already erected, and now sleeping and living quarters for the Colonel, all officers and men are being built within the Camp. At present, with the exception of the Duty Officers and a few men, all the personnel sleep out in the surrounding villages.

More land is being taken up and the end of this year should see the Aircraft Park (at present in Lima) erected and working on the Aviation Camp. The present aerodrome, which has a very poor surface, is being ploughed and rolled and is having fresh grass sown upon it. It will be seen that considerable amount of activity is going on.

The Central Aircraft Depot.

When I arrived in Peru, it was to find the whole Air Force in a state of chaos with Commander Leguia manfully trying to disentangle himself and all around him from the mesh of confusion in which they were. System was absent everywhere, organisation and routine failed to exist. Comdr. Leguia sent me round to view things and told me to tell him what I could suggest.



Mechanics of the Peruvian Air Service and one of their workshops.

This was difficult ; there was no one thing to fix on, everything was wrong. However, it struck me that the first thing to do was to restore order, especially with regard to the machines. The personnel could look after themselves and I was not a Peruvian.

The state of machines was horrible, no other word can describe their condition. There were hardly any spare parts and what there were were lying in the dust. Engine overhauls were a rarity. When an engine needed an overhaul it was taken out and thrown into the dust and a *new* engine was put in. The mechanics did exactly as they liked, and with many of them this was to do nothing, in fact to watch others doing it. Chaos predominated and it was heart-breaking work tyring to make a start.

However, the result was that I started the Aircraft Depot. The first thing was to find a site. After discussion, we finally decided to set up our show in the Escula de Artes y Oficios. This place—the School of Arts and Trades—is an establishment under the Government, wherein boys who show aptitude for mechanics when at school are sent for training. They are given

One of the Avro training biplanes of the Peruvian Army Air Services.

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PERU—*continued.*

four years' training by the Government Staff—free of charge—and are then supposed to be qualified mechanics.

There are five large shops in this establishment, machine and metal working, carpenters, electricians, sculptors, and moulders, and also large drawing offices. The boys are taken in and are put into whichever shop for the trade they are to learn. When we arrived there were 300 boys in the school, all living in, in the school barracks.

We started with nothing, not even a room. However, we were permitted to take over the buildings of a disused electrical transformer shop, and as time went on I took in half the carpenter's shop—with plant—and gradually got things working. The end of six months' work saw us with a working aircraft park.

The stores form a big section and are fairly comprehensive. This section is very efficient and complete stock can be given at one hour's notice. These stores are for the whole service. The engine shop is well fitted up, well lighted, etc., and six engines (and very often many more) are always undergoing overhaul at the same time. I arranged sectioned engines for instruction and there is an inspection bench which is complete for weighing, balancing and viewing the motors during overhaul. There are four engine test benches for the types in use, Hispano, Clerget, Le Rhône and Salmson.

The carpenter's shop was taken over for machine erection, wood-work construction, fabric work and doping. Six to eight machines are always in process of repair, reconstruction or overhaul. Crashed machines are brought in for complete repair, others for reconditioning. All necessary woodwork, fabric assembly, doping, etc., is done in this department. Four joiners, eight riggers and four women are employed.

Machines after repair are assembled and tried and then partly dissembled and taken to the racecourse, on a lorry of patent design, where the erection and inspection is completed. They are then flown to the Las Palmas aerodrome.

During the six months we reconditioned and erected eight machines and flew them all successfully away.

In addition to the foregoing, the Aircraft Park was recently given the contract for the overhaul of all the Government motor cars. So our hands have been fairly full. The personnel of the Depot, not including myself, was four Englishmen, head rigger, engine shop, stores, and woodwork construction and 52 mechanics and women. There are two machinists and metal workers, but the difficulty of obtaining suitable metal in Peru is too great and their work is not very complete.

The Park, as it stands, is in full working order and later when it is moved to the new quarters at the aerodrome it will be very greatly enlarged.

Ancon.

Ancon, which is the naval port and fashionable bathing place for Lima, is the site of the naval flying station. It comprises one 3-stripe lieutenant (teniente de primero), about 10 other officers and 50 men. This station is conducted on efficient naval lines and it is a model of cleanliness and order. The machines in use are the Curtiss boat type. There are only two in use at the moment. In addition there is a big French boat and about three crashed Curtisses.

The Curtisses do practically all the flying and they seem to stand up to the conditions very well. It is rumoured that a battleship is to be taken over as a seaplane mother-ship when the Seaplane Service should increase in size to some extent.

Review.

As a review of the air services in Peru one can only say that the combined service is small. The main trouble is money. Peru is a very rich country, a country richer in natural resources than many others, but the Government is not rich. Taxes are few, small, and far between. There is no income tax, and the Government has very great difficulty in collecting what taxes there are. Peru is only just recovering from the money-making period of the War and will take time to get settled.

The aviation services are started and are going to progress, they should have quadrupled their size in a year or two's time. Commandante Leguia is very keen and is very pushing and he will not be content until Peru has a large and efficient Air Force adequate to the country.

POLAND.

Aerial Journal :—

Lot. Published quarterly. Price : 200 mk. Warsaw. Editor : J. Grzedzinski. The official organ of the Aero Club of Poland, which club may exist as a social institution as there is no civilian flying in Poland.

Civil Air Company :—

Aero Lloyd Warschau (a branch of the big German Combine). Date of Incorp. : 1922. Offices : Warsaw. Services operated : Danzig—Warsaw—Lemberg. Machines used : Junkers.

No replies have been received to various requests for information concerning Polish Aviation. The last information was that though the Polish Army owned some aeroplanes it neither knew how to maintain, fly nor use them. It is therefore to be supposed that flying is not done by Poles in Poland.

THE POLSKI AERO LLOYD.

Information has been received through the Department of Overseas Trade, dated Warsaw, 30th October, 1923, that the air services, Warsaw—Danzig, Warsaw—Lwow (Lemberg), Warsaw—Cracow, which had been suspended for two months, were resumed as from that date. There will be one service weekly in each direction.

The interruption of the service was due to certain financial difficulties, which were caused by the inadequate Government subsidy of 1 kilo of petrol per kilometre of air route. Now that this subsidy has been increased to 2½ kilos, the Company hope to be able to balance expenditure and revenue, but do not expect to exploit the service profitably.

PORTUGAL.

Aerial Societies :—

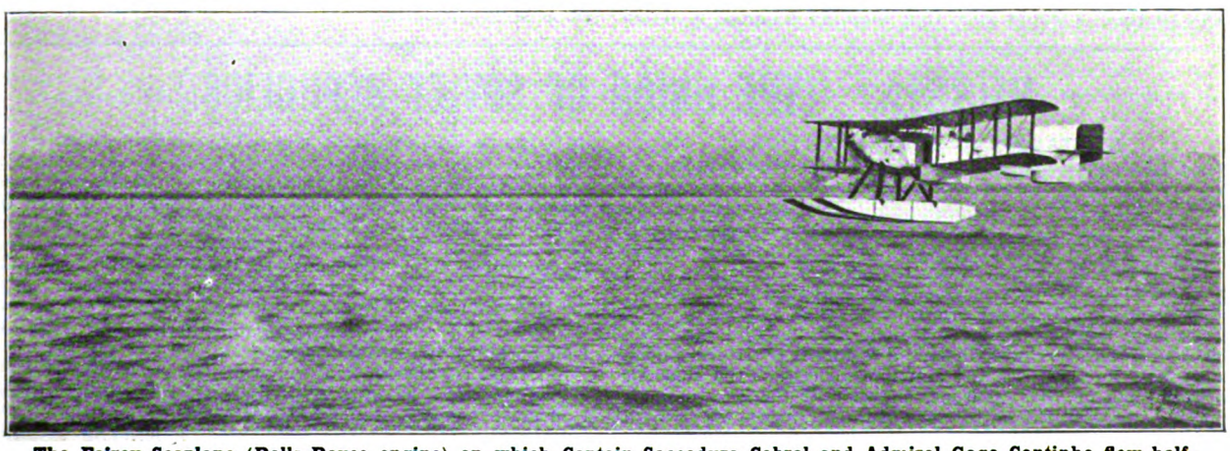
Ae. C. de Portugal, Travessa da Gloria, 22a, 2º, Lisbon.

Aerial Journals :—

Rivista Aeronautica (Ae. C. Journal).

Flying Grounds :—

Villa Nova de Rainha. (Military School). In bad condition.
Alverca do Ribatejo. (International Aerodrome.)
Amadora (near Lisbon). (Military Flying Ground.)
Cintra.
Ponte do Sôr.
Monte Velho (Alemtejo Sul).



The Fairey Seaplane (Rolls-Royce engine) on which Captain Saccadura Cabral and Admiral Gago Continho flew halfway to Brazil from Lisbon. The machine being wrecked, the journey was completed on standard Fairey seaplanes of a smaller type.

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PORTUGAL—*continued.*

Since the War the Portuguese Air Service has continued to develop, and has developed a number of new aerodromes.

The naval service has acquired a number of seaplanes, including some of the British F boats, but no confirmation is to hand as to the exact strength and composition of the services.

The Portuguese Flying Corps, of which Major Costilho Sobre, Director-General of Military Aeronautics, is the Chief, is not large. One might say that its style is cramped by lack of accommodation for machines and other material.

The naval side of the corps is further advanced, and has done very good work, considering the handicap of lack of equipment and adequate support from the Portuguese Government.

NAVAL AVIATION.

[For the following information one was indebted in 1923 to Commander F. A. Branco, Naval Attaché to the Portuguese Legation. Since then no further information has been obtainable.]

THE NAVAL AVIATION SERVICE.

The Portuguese Naval Aviation Service, established more or less hastily during the Great War, notwithstanding during that period having rendered great service to the Allied Cause patrolling the coast, after the Armistice began to progress on a definite basis.

At present it possesses two stations in active progress. One in Lisbon and the other at Aveiro ; a third has been commenced in the south of the country, at Faro.

The aeroplane industry is at present very little developed in Portugal, the material used at the stations being of foreign construction, and there are English, American and French machines.

In the general field of aviation, aerial navigation has been considerably developed, the Naval Aviation Service counting some important long voyages among its activities.

Thus, in 1919 the series began with a flight of two machines, Type F.3, from Calshot to Lisbon, with the crossing of the Bay of Biscay from Brest to Ferrol by one of them, in which the navigation was a great success.

In 1921, Commander Sacadura Cabral and Lieutenant Bettencourt piloted one of these F.3s from Lisbon to Madeira, the navigation being entrusted to Admiral Gago Coutinho, who had begun to devote to this subject his great competence and ability. The brilliant success of this flight animated Commander Cabral to attempt the formidable task of the first crossing of the South Atlantic. The voyage was made in Fairey machines and the scientific world classified it as "a very nice piece of extremely accurate navigation." Admiral Gago Coutinho had resolved the problem of aerial navigation.

The Director of the Naval Aviation Service is Captain Sacadura Cabral, P.N.A.

The Centro de Lisboa has three hangars. Dimensions : No. 1, 20 × 40 m. ; No. 2 and 3, 20 × 28 m. One small slip working and a big launching apparatus projected. Complete workshops being developed. Wireless station, range 150 miles. Pigeon station. Fuel depôts. Spare and supply shop.

There are 25 machines, British, French and American.

Personnel : 178 officers and men.

The Centro de Aveiro has two hangars, 36 × 33m. and 36 × 27 m. (the first being erected). One slip is concrete, 7 m. wide. Workshops completing. Wireless telegraph (range, 300 miles) and telephone (range, 120 miles). Pigeon station. Fuel depôt. Spare and supply shops.

There are 5 flying machines, French-built.

Personnel : 107 officers and men.

ROUMANIA.

The Kingdom of Roumania, now the largest State in South-Eastern Europe, had a small Flying Corps before the War. This was dispersed during the German occupation of the country, but since Greater Roumania was formed by the remobilising of the Roumanian Army after the defeat of Germany and Austria, when Roumanian troops occupied Transsylvania and Bessarabia, a new Flying Corps has been formed.

The following information was received in 1923 by courtesy of the Roumanian Military Attaché, Lt. Col. Douglas Capitaneanu and Major Negresco. Since then no fresh information has been available.

MILITARY AVIATION.

Roumanian Military Aviation is under the control of the Direction of Aviation of the Army. The Director is Colonel Popovici, who learned to fly at the Bristol School on Salisbury Plain before the War. The Inspector of Aviation is Colonel Rujinski.

The Roumanian Flying Corps is divided into three "Groups" corresponding to wings of the R.A.F. (1) Reconnaisance (equipped with Bréguets bought from France and Brandenburgs taken over from the German Army). (2) Fighting (equipped with Spads). (3) Bombardment (equipped with D.H.9s. and Bréguets).

There is a school for pilots and observers and artillery observation at Tecuci. The chief repair depot and Aircraft arsenal is at Bukharest. The school for Mechanics is also at Bukharest.

A newspaper called "Aeronautica Romana" is produced for the Roumanian Flying Corps by the Military Authorities.

It is of interest to note that all four of the Roumanian officers who learned to fly at the Bristol School in 1913-14, namely: Mm. Popovici, Negresco, Beroniadi and Pascanu are all four still actively employed in aviation.

CIVIL AVIATION.

Civil Aviation is a sub-department of the Air Ministry of Communications and is under the control of Director-Engineer Mirea.

This department was at the beginning of 1922 organising and building aerodromes for an air-line from Bukharest to Galatz and Kishineff (Bessarabia) and for a line in the other direction to Prague, in co-operation with the Franco-Roumanie line.

Aerodromes exist at Bukharest (3), Galatz, Jassy, Tecuci, Clug (Transsylvania), Kishineff (Bessarabia), and Arad (Transsylvania), all of which are available for civil aviation for the present.

REPUBLIC OF SAN SALVADOR.

This Central American Republic is said to possess five Aviatiks obtained from Italy. It is said that they have Fiat engines. If this be true, it would seem that they are Austrian Aviatiks with Austrian Fiat engines, and were captured by the Italians at the end of the War. They are equally possibly Italian (S. A. M. L.) Aviatiks.

RUSSIA. (THE UNION OF SOVIET REPUBLICS.)

MILITARY AND NAVAL AVIATION.

The following information concerning Aviation in the Bolshevik Army is collected from fairly reliable German and French sources :—

Up to the year 1922 the Russian Red Army possessed but an apology for an Air Force, which consisted mainly of aged Caudron G.3s and Nieuport Scouts, remnants of the day when the Imperial Russian Government was supplied with aircraft by the French and British Governments.

At a later date, numbers of Italian Ansaldo biplanes, both single and two-seaters, were delivered to Russia by Italian pilots.

This fact, coupled with the announcement that the Red Air Force consists of 70 squadrons, shows that Soviet Russia is beginning to realise the importance of the air.

This announcement may be premature, as the equipment of 70 squadrons with machines, spares, replacements, and above all pilots, observers and mechanics, cannot be accomplished by a country like Russia, whose modern machines cannot total more than a hundred in number. Indeed, it has been reported that certain squadrons possess but two or three machines that are capable of flying, and nothing has been said as to whether these squadrons possess pilots who are capable of flying these machines. Thus the 12 squadrons stationed at Moscow numbered last summer only 28 efficient machines, while Smolensk had 18, St. Petersburg 14, Podosinsk 16, Rostoff 8 and Sebastopol 30.

The following was the intended disposition, late in 1922, of the Red Air Force in Russia in Europe :—

Moscow : 3 observation squadrons, 9 bombing squadrons, 1 air park.

Smolensk : 4 observation squadrons, 1 air park.

Podosinsk : 4 observation squadrons, 1 bombing squadron, 1 air park.

Petersburg : 4 seaplane squadrons, 2 bombing squadrons, 1 air park.

Rostoff : 2 seaplane squadrons, 1 bombing squadron, 1 air park.

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SOVIET RUSSIA—*continued.*

Sebastopol: 5 observation squadrons, 3 bombing squadrons, 1 artillery spotting squadron, 1 air park.

Added to this are 31 observation and bombing squadrons in the Ukraine and Russia-in-Asia stationed at Tambof, Kieff, Kazan, Samara, Orloff, Omsk and Tashkent.

Aircraft repair depôts are at Smolensk (two), Petersburg, Moscow, Kazan, Samara, Orloff, Kieff, Rostoff, Omsk, Tamboff, Sebastopol and Tashkent.

[*The following information is taken from an Air Ministry Communication.—C. G. G.*]

THE BOLSHEVIK PLAN FOR DEVELOPING AVIATION.

The following extracts have been taken from an article published recently in the German aeronautical press :—

The extraordinarily active propaganda carried on by the Soviet Government for the creation of their "Red Air Fleet" puts that of all other countries in the shade, and the method adopted is worthy of note. In the large Federal Republics, companies for the creation of the air fleet have been founded under the direction of the authorities and with the name (unusual for communist Russia) of "Joint Stock Companies of the Volunteer Air Fleet."

Considerable sums have been subscribed to these Companies by all classes of the population. The Companies are naturally controlled by the Government, and it is significant that the head of the "All-Ukrainian Air Traffic Company" is the Peoples' Commissary of the Ukrainian Army.

The total sum already subscribed for the Red Air Fleet amounted to a million gold roubles at the beginning of April, 1923, according to a statement made by Trotsky in a speech at Kharkov and he expressed the wish that this sum would soon be doubled.

In other countries it might be doubtful whether the population would be willing to make the required sacrifice, but this does not appear to worry the Soviet authorities, who do not always enquire into the wishes of the people, but may resort to force in circles where the subscriptions are not forthcoming willingly.

It cannot, however, be denied that the Bolshevik leaders appear to have been successful in arousing the interest of the Communist workmen and employees in aviation and of awaking in them an exemplary readiness to make financial sacrifices for the cause of the Red Air Fleet.

For example, the collection made by the *Isvestia*, the great Moscow newspaper, gave a total of 800,000 million paper roubles, the personnel of a large Odessa factory had unanimously joined the Company for the Voluntary Air Fleet, and at Easter a seven-days week of help was held in aid of the All-Ukrainian Air Traffic.

The metal workers of Yelisavetgrad worked a whole Sunday for the benefit of the Air Fleet, the railwaymen of a Ukrainian district presented a sum for the construction of a special aircraft which is to bear the name of the contributing Union. A newspaper, *The Communist*, is also having an aircraft built with the funds collected by them, which is also to bear their name. Many more similar cases could be quoted. Certainly among the contributors we see the name of a French firm, that of Weiler, which presented a sum of 200 million roubles, but it is doubtful whether this money was given very willingly.

It would be a mistake to think that the leaders of this vast air propaganda have only a military object in view. They also realise the importance of promoting air traffic in so vast a country as Russia, where the possibilities are far-reaching.

The contract which the Soviet has concluded with Junkers gives a clear idea of the Russians' extensive plans from the point of view of communications and economics, since it authorised Junkers to inaugurate an air service from Persia to Sweden.

The Bolshevik leaders are also advocating the use of air traffic as a means of propagating news. They promise the shareholders of their Red Fleet to institute as soon as possible rapid air services for the transport of newspapers and news from the chief towns to all parts of the Federal State.

The special task of the Volunteer Air Fleet is to inspire the great mass of Russian peasant lads with an enthusiasm for flying and to afford them the possibility of carrying out flights. The Bolshevik leaders are naturally convinced, or at least so they say, that the Russian Communist will develop into a "revolutionary airman" whose achievements will one day astonish the world. This, of course, remains to be proved.

On the whole, however, the propaganda which has now been actively and successfully carried on for weeks, has succeeded in obtaining the support of the communist masses of the Russian nation for the air cause.

Russia's neighbour States, against whom the military point of this aerial armament is directed, as well as the other European States, in which the Red Air Fleet hopes to spread its revolutionary propaganda, should in no way undervalue the importance of Russia's activity in aviation. We also hope that German firms which are co-operating with the Soviet Government in aviation will never forget the fact that they are playing a game with the devil.

RUSSIAN NEWS FROM FRANCE.

The French journal *L'Aero Sports* has published certain information concerning the aeronautical activities of Soviet Russia, of which the following is a fairly literal translation :—

We wish to speak of the energetic impulsion given by the Soviets to the development of their aviation, an impulse, the practical result of which is translated to-day by a remarkable extension of an aerial organisation that did not exist two years ago.

This progress is due to a considerable extent to the clear and interesting counsels of the Teuton technicians, a progress that would of its intensity disturb us if, as is happily the case, the instability of its political regime would not compel Russia to be practically entirely ignored by the outside world.

Actually six big firms divide between them orders from the State, which they try to fulfil.

The Dux firm, of Moscow, which incidentally employs the services of 750 workers, turns out weekly four De Havilland aeroplanes per week. And that's all ! !

The Moskwa Works, established also in Moscow, produces four aeroplanes every month, thanks to 350 workers !

The Bolshevik Works, ex-Gnôme Co., specialises in the *mise-au-point* of 180 and 220 h.p. Hispano-Suiza engines, which they deliver at the rate of six per month. They are also studying, one believes, the possibilities of manufacturing "Liberty" engines.

On the other hand, 600 male employees of the Russo-Batigny Co., of Petrograd, assemble 240 h.p. Renault engines.

Also the Moteurs Moscovites have reached, for the moment, a delivery of ten 110 h.p. Le Rhônes a month.

Finally, the Anatra Co., since its installation at Taganrog, with a personnel of 120 workers, has obtained a record with a delivery of 10 seaplanes per month.

Naturally, it is necessary to add to this list companies of lesser importance such as the Lebedeff, Schetinin, Sluzarenko, etc., who mostly have their offices in Petrograd.

This table is sufficiently assuring in spite of the numerous purchases of material made by the Commandant Djevalkovski in Berlin for the Soviet Aerial Forces.

That which is less assuring, for example, is the silence concerning the organisation of vast factories of which Junkers have assumed direction. We have already mentioned these rumours, which the facts, notably certain short paragraphs that have appeared in the Soviet Press and an interview with the Director of the Aerodynamic Institute in Petrograd, seem unfortunately to confirm only too well.

CONTROL OF CIVIL AVIATION.

A regulation was issued by the Council of Labour and Defence on February 9, 1923, to the following effect :—

1. The general technical control of the air lines existing within the Russian Republic and those air lines which will be established in the future is temporarily entrusted to the General Administration of the Red Air Fleet, the actual work to be carried out by the inspectorate of civil aviation.

2. The regulations with respect to the opening of new air lines and to their operation and commercial and administrative control are entrusted to the permanent Civil Aviation Council, who will be assisted by various departments (General Administration of the Red Air Fleet, Posts, Telegraphs, Ways and Communications, etc.).

With regard to (1), the following matters come under the heading of technical control :—Classification of the types of aircraft and their equipment, use of aerodromes and hangars, rules of the air, regulations regarding the use of W/T, signalling, log books and other documents, rules for the acceptance of flying and technical personnel.

As regards (2), the Civil Aviation Council is responsible to the General Administration of the Red Air Fleet.

This arrangement is merely temporary ; later, when aviation in Russia is more fully developed, it may be necessary to have a special department to deal with civil aviation alone.

AERIAL SOCIETIES.

"Friends of the Red Air Fleet" Association.

A number of towns, unions and clubs of peasants have decided to raise funds to construct aircraft in connection with the above Association. A wide propaganda campaign is being carried on throughout Russia in connection therewith, and many peasants' unions are subscribing a large number of shares.

The Anglo-Russian Co-operative Society, "Arcos," has given the sum of £1,500 to the Association, with a request for membership. The gift has been accepted and is to be used for constructing an aeroplane.

The "Dobrolet" Company.

Early in March, 1923, Krasnostchekoff, Chairman of the Russian Mercantile Trading Bank, took up the question of organising civil aviation in Russia on a commercial basis. The outcome was the foundation of the Russian Volunteer Air Fleet Company "Dobrolet," which commenced work on March 17, 1923.

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SOVIET RUSSIA—*continued.*

The initial capital was 500,000 gold roubles, but it was found that the idea of organising a civil air service in Russia was so popular that in April it was found necessary to increase the capital to 2 million gold roubles, in order to promote organisation on a larger scale, and 1½ million gold roubles were already subscribed by May 1st. It is not likely that even a capital of 2 million will suffice, and probably further shares will be issued.

The "Dobrolet" is organised on the lines of the Russian Volunteer Mercantile Fleet and is the first Russian air traffic enterprise. The Government is supporting and subsidising it until it becomes self-supporting.

As the "Dobrolet" has no aircraft of its own, the Directorate of the Red Air Fleet decided to lend a number of de Havillands, Vickers-Vimy and Junkers aircraft. The Company placed orders for 15 aircraft; two aircraft were to be ready by the middle of May and the rest during the next three months. In addition, the aircraft factories of the Military industry have received an order for an aircraft of original type, designed by Russian engineers and pilots. The fact that the "Dobrolet" has placed these orders in Russia will give an impetus to construction in the national aircraft factories.

The technical commission of the "Dobrolet" is engaged in studying air lines with Moscow as a centre and intends to ask the Government for sanction for opening the following lines as soon as possible :—(1) Moscow—Ivanorva—Voznesensk—Nizhni Novgorod. (2) Moscow—Kharkoff. (3) Moscow—Petrograd. (4) Moscow—Minsk, with extension to Warsaw.

The last-named line is the most important, as it will permit of linking up with the main air lines in Western Europe via Warsaw. Agents of the "Dobrolet" are already engaged in negotiations for the acquisition of land from the various towns for the purpose of establishing aerodromes and in preparing an organisation that will be in readiness as soon as the aircraft ordered are delivered.

Certain autonomous republics have applied for shares in the "Dobrolet," their object being the establishment of local air lines in these republics, e.g. :—

The Central Asia Republic has asked for assistance in organising the lines :—(*a*) Bokhara—Khiva. (*b*) Bokhara—Dushambe. (*c*) Tashkeut—Almata (Vernoi).

The Kirghis Republic has asked for assistance in organising the lines :—(*a*) Orenburg—Kustanai—Semepalatinsk. (*b*) Orenburg—Uralsk.

The "Dobrolet" is examining the question of the organisation and cost of these lines.

The "Ukrkrima" Aviation and Air Traffic Company.

The adminstration of the "Ukrkrima" (Ukraine and Crimea) Aviation and Air Traffic Company is at present engaged in organising the following air lines :—Odessa—Ekaterinoslav—Kharkoff—Orel—Moscow, Kharkoff—Kieff and Kharkoff—Simferopol.

The Civil Aviation Council of the Air Fleet Administration has granted the Ukrkrima Company a sum of 140,000 gold roubles to be used for the erection of concrete hangars at the Kharkoff and Kieff aerodromes and for levelling the said aerodromes.

Trans-Caucasian Air Traffic Company.

The German Press reported in July, 1923, that at a meeting of representatives of the Soviet Army, the Peoples' Commissaries and a number of State Economic organisations, a company was founded with the object of establishing a trans-Caucasian air line. Capital amounting to 500,000 gold roubles is said to have been subscribed by persons attending the meeting.

AIR TRANSPORT DEVELOPMENTS.

The following information has been received through the Department of Overseas Trade :—

1. *Dated Moscow, June* 30, 1923 :—Six Junkers aeroplanes which were allocated to the Ukraina were to be operated by an institution known as "Ukrvozdukhput" ("The Ukraina Aerial Way").

It was hoped by July to open services twice weekly on the following routes :—Moscow—Orel—Kharkoff—Ekaterinoslav—Odessa, Kharkoff—Kieff, Kharkoff—Ekaterinoslav—Simferopol.

2. *Dated Moscow, July* 6, 1923 :—The "Dobrolet" service between Nijni—Novgorod and Moscow was also expected to commence on July 15. The aeroplanes will leave Moscow at 8 a.m. on Sundays, Wednesdays and Fridays, and return from Nijni—Novgorod at 6 p.m. on the same days. A stop is to be made en route at Ivanovo-Vosnesensk.

Note.—The "Ukrvozdukhput" mentioned under (1) above appears to be identical with the "Ukrkrima" (Ukraine and Crimea) Air Transport Company.

Moscow—Tiflis Line opened.

Information has been received through the Department of Overseas Trade that an air line between Moscow and Tiflis was opened on May 31, 1923. This is part of the line which the Junkers Werke A.G. propose to establish between Sweden, Soviet Russia and Persia, under the terms of the agreement recently concluded by the company with the Soviet Government.

One trial trip to Teheran has been carried out, but it is understood that a regular service to Persia will not be instituted until the Russo-Persian negotiations for a commercial treaty reach a successful conclusion.

SIAM.

AERIAL SOCIETY.

At the present moment such a club does not yet exist, but the Siamese public takes great interest in aviation, there is therefore a possibility of this club being founded in the near future.

MILITARY AVIATION.

[For the following information one is indebted to Lt.-Col. Prince Pridi, the Siamese Military Attaché in Paris and London.]

Previous to the great War, Siam had already realised the usefulness of aircraft. In 1911, the Ministry of War sent three officers of the Royal Engineers to study the art of flying in France. After having obtained their certificates, they returned to Siam in 1913.

The Siamese Royal Flying Corps was then established to train pilots and organise Military Aviation.

When the Siamese Government declared war on the Central Powers, in 1917, a contingent of pilots and mechanics, together with motor transport and troops, were sent to join the Allies in France. At the end of the War, owing to all the world's progress in aviation, and owing to the necessity for the development in flying service for military, and above all for civil purposes, the Royal Flying Corps was then turned into the Royal Aeronautical Service, with the aim to direct the general aviation of the country and to seek the ways and means of using aircrafts for public benefit.

On October 13th, 1920, the Siamese Government signed the International Convention concerning Aerial Navigation.

The Siamese Aeronautical Service employs three types of machines, Spad, Nieuport and Bréguet, and possesses repairing shops and an aeroplane factory. There are primary flying schools and schools for advanced flying.

Siamese Officer Aviators.

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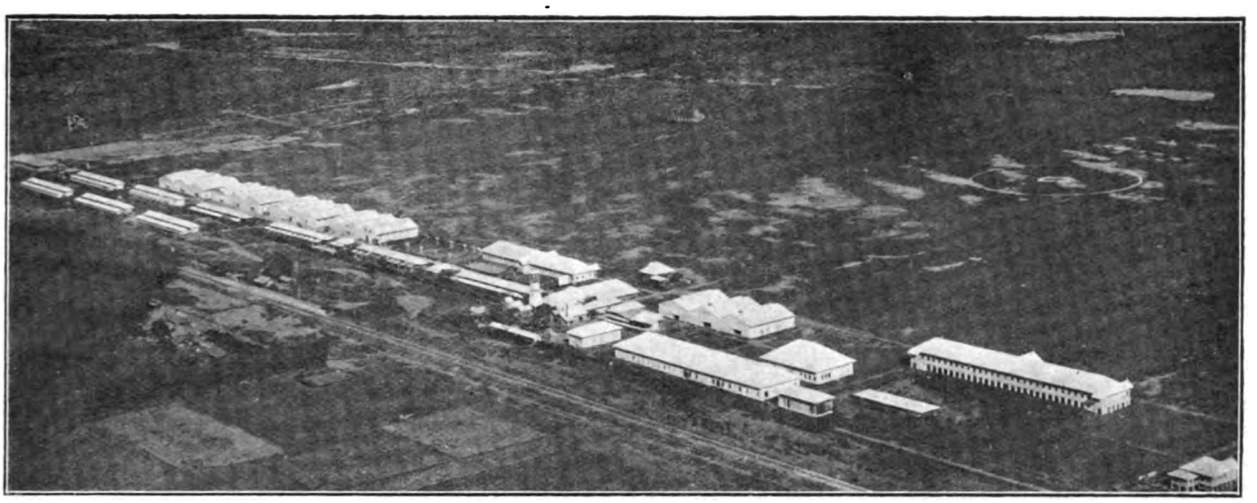

The International Aerodrome of Donmuang, 20 kilometres from Bangkok.

AERODROMES.

There are four aerodromes open to international aerial navigation :—

(1) The Singora Aerodrome, for aircraft coming from the South.
(2) The Ubon Aerodrome, for aircraft coming from the East.
(3) The Chiengmai Aerodrome, for aircraft coming from the West and the North.
(It is intended to have air-stations, with custom service, at these three aerodromes.)
(4) The Donmuang Aerodrome, which is situated about 20 kilometres from Bangkok. This will be the largest air station in the country for International Aerial Navigation. There are quarters and a canteen for aviators and passengers from foreign countries, and also a repairing shop, hangars, with various signals to facilitate the landing and taking off of aeroplanes. Communication with Bangkok is by rail, and in the near future a motor-train service will be opened.

Besides the aerodromes above mentioned, there are landing places in practically every district, each marked with a letter.

CIVIL AVIATION.

The system of communications of Siam is not yet completed, and aeroplanes are therefore particularly useful at the present moment. Thus the chief uses of aeroplanes are for surveying, the carrying of mails, and transporting of machines, doctors and patients. In the future, there may be passenger and goods services.

AERIAL MAIL SERVICE.

Two experimental flights were made. One between Bangkok and Chandhaburi (South East), a distance of 250 kilometres, which can be covered by aeroplane in just over one hour, whilst it takes nearly two days by boat. Another between Bangkok and Korat, a distance of 250 kilometres, nearly 10 hours by train.

Owing to the results of these experiments, it was agreed between the Royal Aeronautical Service and the Post and Telegraph Department, that mails should be carried by aeroplane over the following routes :—(1) Korat Roi and Et Ubol—400 kilometres. (2) Korat Roi and Et Udoru and Knonghai—450 kilometres. These services run once a week.

TRANSPORT OF MEDICINES, DOCTORS AND PATIENTS.

In 1921, an epidemic broke out in the province of Ubon (East). and the stock of medicines ran short, the authorities therefore requested the Public Health Department to send medicines and a doctor to this province with the shortest delay. This Department then asked the Aviation Department for the use of aeroplanes, as means of conveyance, and the doctor arrived with medicines at Ubon within three hours, whereas the alternative means of communication by land takes about a fortnight.

SURVEYING WITH AEROPLANES.

In Siam, as in other countries with an incomplete system of communications, the ordinary method of surveying by land is rather difficult and expensive. Aeroplanes can help a good deal in this work. Thus, the plan of Bangkok has already been completed by surveying from the air.

SPAIN.

Aerial Societies :—

Real Aero-Club de España (12, Sevilla St., Madrid).
Asociacion de Locomocion Aerea, Barcelona.
Real Aero-Club de Barcelona.
" " de San Sebastian.
" " de Santander.
" " de Granada.
" " de Oviedo.

Aerial Journals :—

Alas. Founded : 1922. Published monthly. Price 1 peseta. 4, Plaza de la Leaftad, Madrid Director : Antonio de Lezama.

Aérea. Founded : 1923. Published monthly. Price 1 peseta Glorieta de Atocha 8, Madrid.

Espana Automobil y Aeronautica. Founded : 1907. Published twice monthly. 5, Plaza de Isabel II, Madrid.

Civil Air Companies :—

Cia. Aero Maritima Mallorquina. Offices : Barcelona. Services operated : Barcelona—Palma. This company was organized by an association of Mediterranean shipbuilders to work air mails services between Spain and the Balearic Isles. Negotiations were begun in October last for the fusion of this company with the French Lignes Aeriennes Latecoère.

Cia. Espanola De Trafico Aereo. Offices : Seville. Services operated : Seville—Larache. This company opened the first regular Spanish air line, between Seville and Larache, on 15th October, 1921, with De Havilland 9 (Siddeley " Puma ") machines.

THE SPANISH AERONAUTICAL SERVICES.

The " Negociado de Aerostacion y Aviacion " of the " Ministerio de Fomento " (Public Works Department) is concerned to the civil aeronautics on Spain.

The " Servicio de Aeronautica Militar " is commanded by a General Director, and has two " ramas " (wings) : the " Rama de Aerostacion " which is concerned with captive and free balloons and airships, and the " Rama de Aviacion " which is concerned with aeroplanes and hydro aeroplanes.

The " Servicio de Aeronautica Naval " is under organisation on the Admiralty.

The " Parque de Aerostacion " (Balloon Yard) is at Guadalajara, and the " Aerodromo Central de Aviacion " (Main Military Aerodrome) is at Cuatro Vientos, near Madrid.

There is a " Comision Aeronautica Interministerial " with official representatives of every department, which is charged with studying the rules and regulations of flying in Spain.

THE CHIEFS OF SERVICES.

The following are the Chiefs of the various Aeronautical Services :—

Chief of the Aeronautical Section at the Ministry of War : Colonel Exmo. Sr. D. Rafael Coello y Olivan.

Director of the Air Service : General Exmo. Sr. D. Jorge Soriano Escudero.

Chief of the Troops of the Service : Lieut. Col. D. Cesar Tiestos (R.E.).

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SPAIN—*continued.*

Officers and Men of the Spanish Navy and a Blackburn Torpedo Machine with Napier "Lion" engine.

Chief of Aerostation : Colonel D. Cesareo Tiestos Clemente.
Chief of Aviation : Colonel Exmo. Sr. D. Alvarez-Espajo y Gonzalez Castajon.
Inspector of Aviation Works : Major D. Eduardo Barron (R.E.).
Instructor of Observers' School : Major D. Luis Gonzalo Vitoria (Staff).
Chief of the Aerodynamical Laboratory : Major D. Emilio Herrera (R.E.).

THE AERODYNAMICAL LABORATORY.

The Aerodynamical Laboratory at Cuatro Vientos, which was recently finished, is fitted for the mechanical tests of materials, chemical analysis of fuels, oils and dopes, and for offices. The rear part of the laboratory contains a closed wind tunnel with an experimental chamber which is crossed by a cylindrical current of air 10 ft. in diameter, which reaches a speed of 110 miles per hour. The fan employed has a four-blade airscrew of 13 ft. diameter, revolving at 700 r.p.m., with a 700 h.p. Fiat engine.

At this establishment the two machines here described were developed.

The Barron chaser is a single-seater fighter fitted with a 200 h.p. Hispano-Suiza engine ; on its trials it has made a speed of 128 m.p.h. and climbed to 6,500 ft. in six minutes.

The Barron two-seater reconnaissance biplane is also fitted with a 200 h.p. Hispano-Suiza engine. Its speed is 115 m.p.h. and its climb to 6,500 ft. fully loaded is nine minutes.

THE SPANISH AERODROMES.

The following is a list of the chief Spanish military aerodromes, together with the rank and names of the officers commanding :—

Cuatro Vientos (Madrid).—Major D. Emilio Baquera (R.E.).
Guadalajara.—Captain D. Manuel Loma (Inf.).
Jetafe.—Captain D. José Gonzalex Estéfani (Art.).
Sevilla.—Captain D. Angel Pastor (Art.).
Los Alcazares (Cartagena).—Major D. Alfredo Kindelan (R.E.)
Zaragoza.—Major D. Luis Palanca (R.E.).
Granada.—Major D. Luis Davila (R.E.).

The following are the aerodromes in Africa, with their commanding officers :—

Arcila.—Captain D. Baltasar Chinchilla (Inf.).
Tetuan.—Captain D. Apolinar Saez de Buruaga (Inf.).
Zeluan.—Captain D. Pio Fernandez Mulero (R.E.).
Chief of the Spanish Aviation in Morocco : Major D. José Aymat (Staff).

There are also civil aerodromes at Lasarte (San Sebastian), Prat de Llobregat (Barcelona), Guadalajara, Vitoria, Santander, Carabanchel (Madrid), Alicante and Malaga.

The Spanish Navy has one aerodrome and flying school at Barcelona.

A Torpedo Development Flight has just been opened at Barcelona, and 3 Blackburn "Swifts" have been purchased. Instruction is in the hands of Capt. H. J. Andrews (late R.N.A.S. and R.A.F.).

Commanding Officer of the Barcelona Station : D. Francisco T. de Andrede.

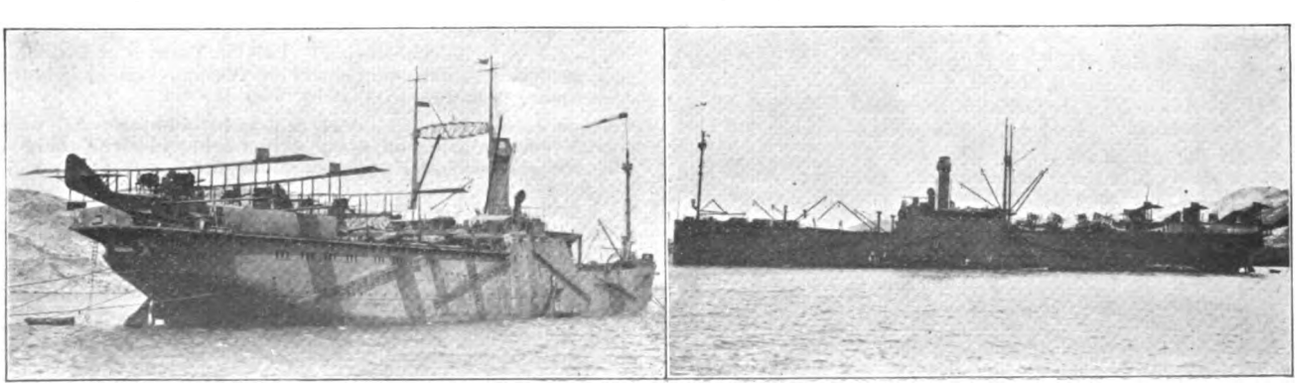
SPANISH FLYING SCHOOLS.

Military Schools of Aviation.—Cuatro Vientos, Sevilla, Zaragoza, Los Alcazares, Jetafe.

Civil Schools of Aviation.—Hereter (Barcelona), Anglo-Hispana (Carabanchel).

CIVIL AVIATION.

The Kingdom of Spain has selected the letter "M" as the national identification mark of Spanish aircraft. The registration mark is a group of letters beginning with A for civil aeroplanes, M for military aeroplanes, and N for naval aeroplanes, EA, EM, and EN for civil, military and naval free balloons respectively, and DA, DM, and DN for civil, military and naval airships respectively.



Spain's Aircraft Carrier, "Dedalo."

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SPAIN—*continued.*

SPANISH AIRCRAFT CARRIER.

The following is the aircraft-carrying ship owned by Spain :—

DEDALO.

Built by Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne, in 1901, as S.S. "Neuenfels," afterwards "España No. 6." Transformed in 1922. Has forward accommodation for one small airship, 42 m. long, and has complete hydrogen plant. Aft there is seaplane accommodation, workshops, etc.
Normal capacity : 25 aircraft, 2 dirigibles and 2 balloons.
Displacement : 10,800 tons.
Length : 420 ft.
Beam : 55 ft.
Draught : 20½ ft.
Guns : 2—4.1 in., 2—1 pdr.
H.P. : 3,000.
Speed : 12½ kts.
Complement : 324.

SWEDEN.

Swedish-built Biplanes of the Swedish Army.

Aerial Society :—

Kungl. Svenska Aeroklubben (The Royal Aero Club of Sweden), Fenixpalatset, Stockholm.

The Club, which belongs to the Fédération Internationale Aéronautique, is a very active club with about 800 members. A part of the Club is established in Gothenburg.

In January, every year, the Club is arranging a great flying day in Stockholm, similar to the Aerial Pageant at Hendon.

Chairman of the Club is General H. Wrangel, and Secretaries Captain S. Asbrink and Captain C. Florman.

The Club has registered, until beginning of 1924, 300 Swedish aviators.

Aerial Journals :—

Svensk Motortidning, Stockholm, official organ of the Royal Aero Club of Sweden.

Private Flying Schools :—

Orebro Flygaktiebolag, Orebro.
Aktiebolaget Gothenburgs Luftdroskor Gothenburg.

Manufacturers of Aircraft :—

Svenska Aeroaktiebolaget, Lidingön, Stockholm, producing Hansa-Brandenburg seaplanes.

MILITARY AVIATION.

Chiefs of the Swedish Military Aviation Service :—

General Officer Commanding : Maj. General A. Odelstierna.
Officer Commanding : Colonel C. Erikson.
Chief of Army Air Service at Malmslätt : Captain G. von Porat.

Chiefs of the Swedish Marine Aviation Service (Marinens Flygväsende) :—

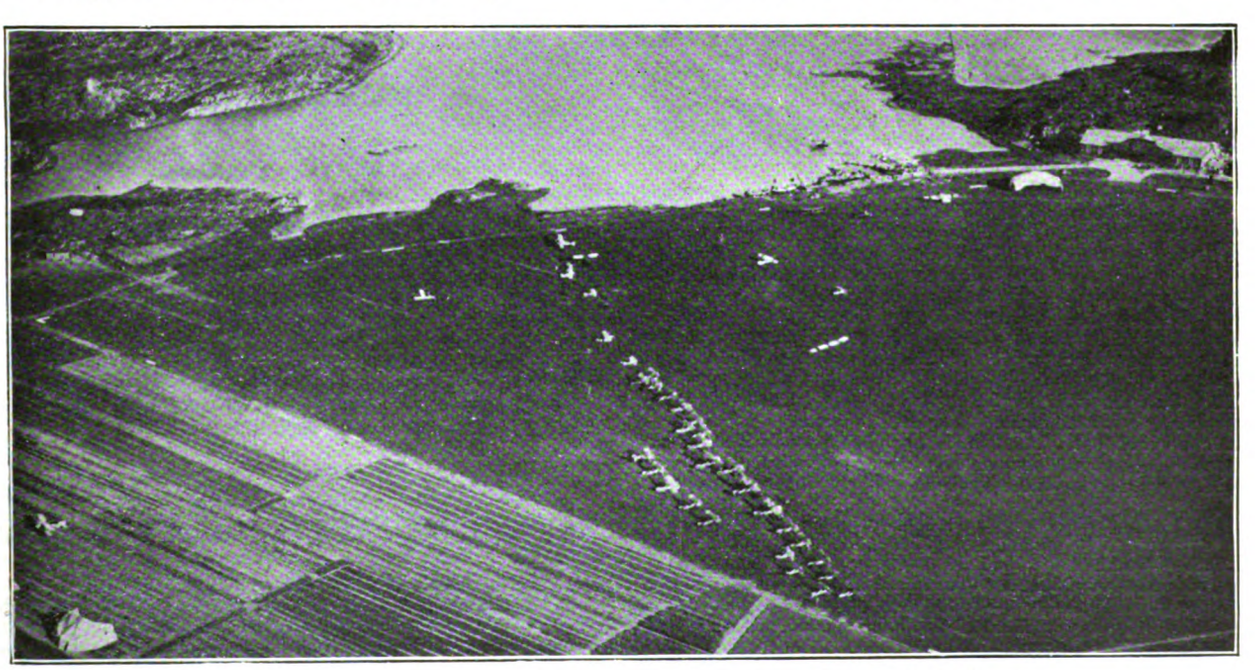
Officer Commanding : Commander Th. Lübeck.
Chief Engineer : T. Ångström.

Flying Grounds :—

Stockholm (Barkarby), **Orebro, Goteborg, Ljungbyhed, Kristianstad, Malmo.**

Military Flying Schools :—

For the Army : **Malmslätt.**
For the Navy : **Karlskrona, Hägernäs** (at Djursholm).



Torslanda Aerodrome, near Gothenburg, with accommodation for both aeroplanes and seaplanes.

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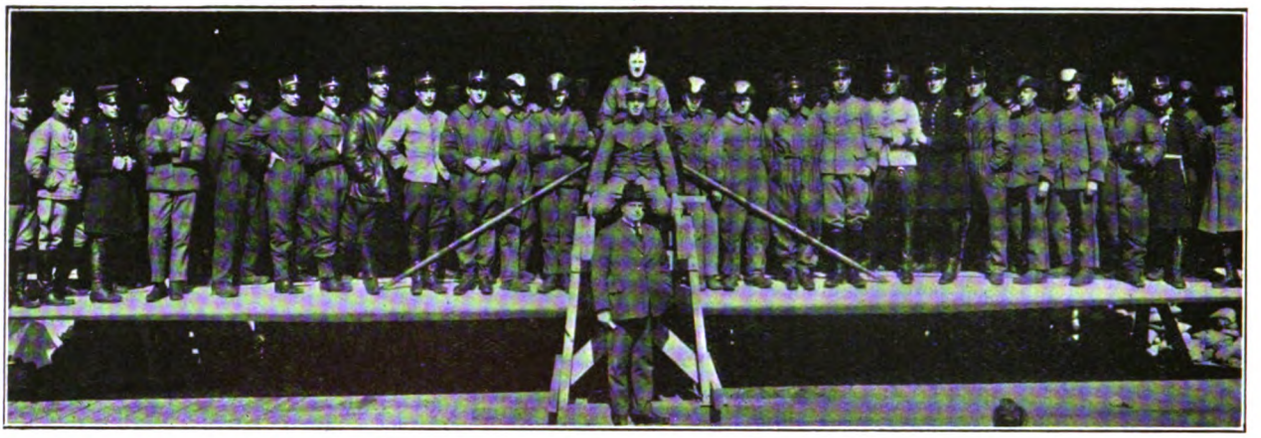
SWEDEN—*continued.*



Officers and men of the Swedish Army Flying Service, demonstrating the strength of wing of a Swedish aeroplane.

CIVIL AVIATION.

The Orebro Flygaktiebolag, Orebro.

This is the former Orebro Flygkompani, founded 1921. Manager: Mr. Th. Dieden. Chief Pilot: Ing. Ballod. Flying School and Head Station: Karlslund, close to Orebro. The company has about six machines: Avro, de Havilland, Rumpler, Junker, Junkers.

CIVIL AERODROMES.

Stockholm, Gothenburg, Malmo and **Orebro.**

An air line between Malmö—Hamburg will be opened in April, 1924, to take mail from Sweden, Norway and Finland the quickest possible way to the South-west of Europe. Junkers aeroplanes will be used.

In July and August, 1923, an International Aero Exhibition was held in Gothenburg, and in connection with the Exhibition were Military and Civil Flying Competitions, in which Swedish, Norwegian, Danish, German, British, French, Czecho-Slovakian and Dutch aviators took part.

A Section of The Swedish Flying Corps under Winter Service Conditions.

SWITZERLAND.

(Kindly corrected by Major Isler).

Aerial Socieites :—

Aéro Club Suisse. (President: Lt. Col. Messner, Thoune; Secretary: E. Coeytaux, Palais Fédéral, Bâtiment Nord, Berne.)

Sections :—Club Suisse d'Aviation, Geneva.
Section Romande, Lausanne.
Section Mittelschweiz, Berne.
Ostschweiz Verein für Luftschiffahrt, Zürich.
Société des Aviateurs Militaires, Zürich.

The Aéro Club (Section Mittelschweiz) organised a Military Aviation Meeting at Thoune on July 15, 1923.

The Sporting Committee of the Aéro Club granted during 1923, 8 sporting brevets, 13 commercial brevets and 4 balloon brevets.

Fifteen balloon flights were organised by the various sections. Three pilots took part in the 1923 Gordon-Bennet International Balloon Race. Capt. Armbruster, with his aide, 1st Lieut. Bachmann, obtained third place. 1st Lieut. Grünigen and his aide, M. Wehren, were killed by their balloon " Genève " catching fire.

Aerial Journal :—

A.C.S. Bi-monthly. (Official journal of the Automobile Club and official organ of the Aéro Club Suisse.) Contains a section—Aéro-Revue—devoted to aeronautics. Editorial offices: Secretariat Central de l'Aero Club, Palais Federal, Bâtiment Nord, Berne.

MILITARY AVIATION.

A certain number of pilots and observers train monthly at Dübendorf and Thoune, all pilots being obliged to put in at least ten hours' flying per month and all observers three hours per month.

A new training centre is to be organised at Lausanne-Blécherette.

Except for a few single-seater scouts and one type of two-seater observation machine, all aircraft belonging to the Army Air Service are constructed at the Fédéral Aircraft Works (Ateliers Fédéraux) at Thoune.

The aerodrome at Dübendorf, which is at the same time a Customs aerodrome, and from which two civil companies operate, is being improved and enlarged from year to year.

The Technical Branch (Services Techniques) of the Military Aviation is excellent, which fact is proved by the absence of any failure of material. For over three years there has been no fatal accident in the Military Air Service.

CIVIL AVIATION.

Director of Civil Aviation (Office Aérien Fédéral): Major à l'E.M.G. A. Isler, Berne.

Aviation Companies (commercial) :—

Aéro Lausanne S.A. (Air taxi company and school of aviation). Aerodrome: Blécherette, Seaplane station: Pully, near Lausanne. Address: Blécherette-Lausanne (Tel. 2752).

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SWITZERLAND—*continued.*

Ad Astra-Aéro Avion Tourisme Suisse S.A. Aerodromes Dübendorf (Zurich) (Tel. 76); Cointrin (Geneva) (Tel. Gve/Mt. Blanc 4600); Zürichhorn (seaplanes) (Tel. Zürich-Hott. 4694). Address: Zürich Dufourstrasse 175 (Tel. Zürich-Hott 1274).

Runs the air line Geneva—Zurich—Munich. Also: Aerial photography, school work, joy-rides, meetings, aerial surveys, etc.

Alfred Comte, Luftverkehr. Aerodrome: Dübendorf (Zurich) (Tel. 95). Seaplane station: Horgen (Zürich) (Tel. 267). Address: Zürich Rämistrasse 7 (Tel. Zürich-Hott. 7130). Aviation school, joy-rides, meetings, aerial surveys, overhauling and reconditioning aircraft, automobiles, etc.

Aerodromes with Customs Facilities:—

Regular Customs Aerodromes.
Zürich-Dübendorf.
Genève-Cointrin.
Lausanne-Blécherette.

Extra Customs Aerodrome:—

Bâle-Sternenfeld (for announcing arrivals in advance to the "Gemeinde-Büro," Birsfelden, near Bâle.

Regular Customs Seaplane Stations:—

Genève (Eaux-Vives).
Lausanne (Ouchy).
Locarno.
Lugano.
Lucerne.
Rorschach.
Romanshorn.
Zürich (Zürichhorn).

Special Seaplane Customs Stations (for frontier traffic):—

Ermatingen.
Kreuzlingen.

Other aerodromes or landing grounds exist at Thoune, Berne-Beundenfeld, Payerne, Bière, Bellinzone, Frauenfeld, Olten, Coire and Interlaken, with a seaplane station at Horgen. In addition there are a number of forced-landing grounds.

The Société Ad Astra exploit the line Geneva—Zurich—Münich (in 1922, Geneva—Zürich—Nuremberg) with a daily service in each direction for passengers and mail. The line operates from May 15 to October 30.

At Munich, a connection for mails is made with the express night trains to Berlin and Vienna, delivery in these cities being made in the early hours of the morning. Since the opening of the line in 1923, the machines of this company have covered 133,500 kms. (in 1922, 95,300 kms.) and carried 1,137 passengers (in 1922, 468 passengers).

The Chief of the Photographic Section of the Société Ad Astra took part in the expedition organised by the Swedish Government to assist the explorer Amundson during the summer of 1922 in his projected flight from Nome (Alaska) to Spitzbergen. This expedition, which had already begun when it was learnt that the Polar flight would not take place, proceeded to Spitzbergen, and during the many flights over this region took many aerial photographs and cinematograph films.

The line London—Paris—Bale—Zürich was operated by the Handley-Page Transport, Ltd., from August 16 to September 30, 1923, with three services per week in each direction; London—Zürich on Monday, Wednesday and Friday, and Zürich—London on Tuesday, Thursday and Saturday. From October 1 (until April 30, 1924) the winter service operates once a week from Paris only, Paris—Zürich on Fridays and Zürich—Paris on Mondays. During August and September, the percentage of regularity maintained was 84.4%, 16,954 kms. were flown and 351 passengers carried.

Neither the Société Ad Astra nor the Handley-Page Transport experienced any accident during 1923.

The Swiss Civil Aviation Company benefitted during 1923 to the extent of the following subsidies:—50,000 francs from the Federal Railway Department (Département Fédéral des Chenins de fer) and 50,000 francs from the Postal Department (Administration des postes). The Military Department, in addition, pays 400 francs per pilot per month to civil companies employing military pilots.

The Handley-Page Transport, Ltd., receives from the towns covered by the service (i.e., Zürich and Bale) and from the Postal Departments sums amounting to 750 francs for each trip from London to Zürich, or vice versa, completed.

TURKEY.

Under the terms of the Armistice of 1918 the Turkish Empire is not allowed to own any aircraft for war purposes.

Towards the middle of 1920 the Turkish Nationalists under Kemal Pasha carried on war against the opponents of Turkey in the greater War of 1914-18.

When Kemal's forces retreated in Anatolia in June and July, 1920, some wrecks of aeroplanes and aerodromes which had belonged to the German and Austrian forces with the Turks in 1918, were discovered by the R.A.F. But there was nothing to show that Kemal's forces had ever been able to use these machines.

Later some aeroplanes were supplied to the Turks by the French, and these were used against the Greeks in the defeat of the Greek Army in 1922. It is not known whether the pilots were Turks, French, Germans, or Russians.

UNITED STATES.

By Ladislas d'Orcy, 225, Fourth Ave., New York City.

Aerial Societies:—

National Aeronautical Association of U.S.A.—National Headquarters: 1623, H. Street N.W., Washington, D.C. President: Frederick B. Patterson. Vice-President: Ralph H. Cram. Treasurer: Benjamin F. Castle. Secretary: Dudley M. Outcalt. Chairman of the Contest Committee: Col. F. P. Lahm.

Aeronautical Chamber of Commerce of America.—Offices: 501, Fifth Avenue, New York. President: Frank H. Russell. First Vice-President: Allan Jackson. Second Vice-President: Sherman M. Fairchild. Third Vice-President: Donald M. Douglas. Treasurer: Charles H. Colvin. General Manager and Assistant Treasurer: Samuel S. Bradley. Secretary: Luther K. Bell. Assistant Secretary: Owen A. Shannon.

Aerial Journals:—

Aviation. (Weekly, 10 cents per copy. Subscription per annum: $4.00 in U.S.A.; $5.00 in Canada; $6.00 foreign.) Published by the Gardner-Moffatt Co. Inc., 225, Fourth Avenue, New York. President: Lester D. Gardner. Editor: Ladislas d'Orcy.

Aero Digest. (Monthly, 25 cents per copy. Subscription per annum: U.S. $3; Foreign $4.) Published by The Aeronautical Digest Publishing Corpn., 220, West 42nd Street, New York City. Associated Editors: Clifford A. Tinker and Edward D. Marshall.

Slipstream. (Monthly, 20 cents per copy. Subscription per annum: U.S. $1.75; Canada $2; Foreign $2.5.) Published by the Slipstream Publishing Co., 408, Beckel Building, Dayton, Ohio. Editor: Fred F. Marshall.

U.S. Air Services. (Monthly, 25 cents per copy. Official organ of the Army and Navy Air Service Association. Subscription per annum: $3.00 in U.S.A.; $4.12 foreign.) Editor: Earl N. Findley, Star Building, Washington, D.C.

Aeronautical Experimenter, Aeroplane and Autoage, Air Power, Pacific Aeronautics and *Wings* have discontinued publication.

ARMY AIR SERVICE.

The U.S. Army Air Service is, since the summer of 1921, a combatant arm of the Army, on par with the Infantry, Cavalry, Artillery and Engineers.

The service is commanded by Maj. Gen. Mason M. Patrick, Chief of Air Service. Brig. Gen. William Mitchell is Assistant Chief of Air Service.

PERSONNEL STRENGTH.

Congress limited in 1922 the personnel strength of the Army Air Service to 8,500 officers and enlisted men, as against 17,516 provided for in the National Defence Act.

The authorized strength of the Air Service is 1,061 officers and 8,764 enlisted men, including 190 flying cadets.

The civilian personnel on the pay roll of the Air Service numbered 3,250 in 1923. This number includes 1,180 employees at McCook Field, the seat of the Engineering Division of the Air Service.

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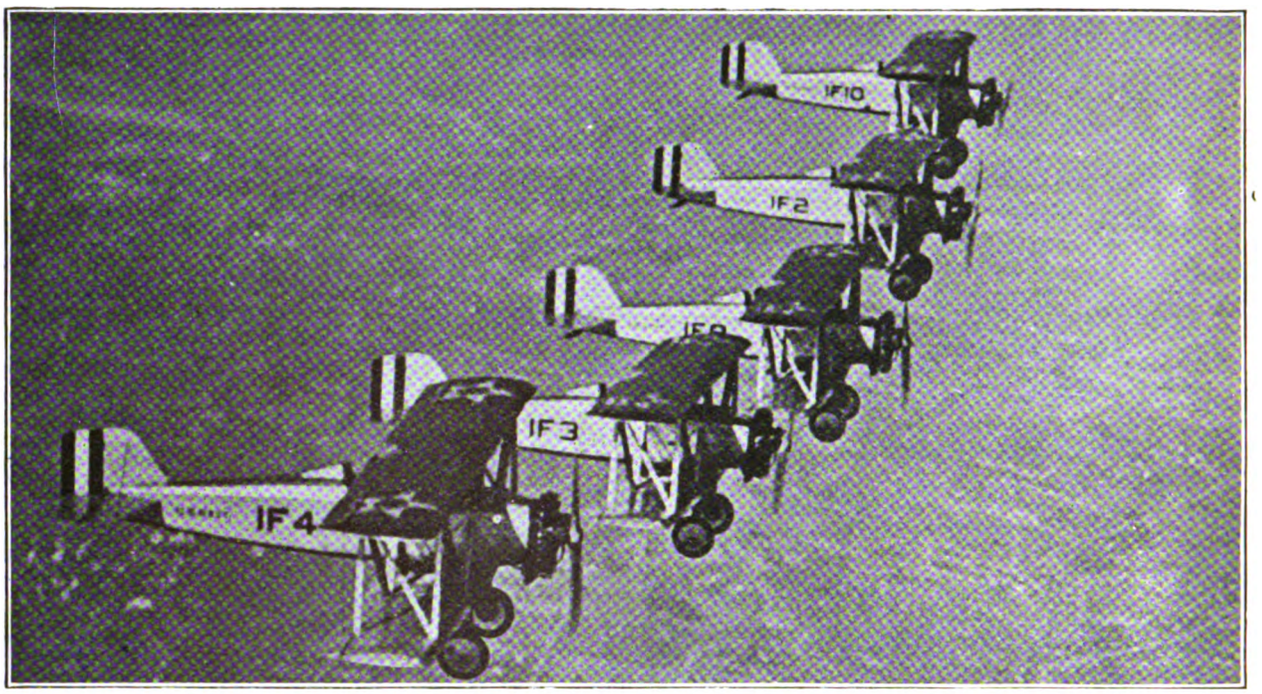
UNITED STATES—*continued.*



A Formation of Fighting Machines of the U.S. Naval Air Service.

ORGANISATION.

The Office of the Chief of Air Service is divided into five main divisions, as follows :—I : Personnel. II : Information. III : Training and War Plans. IV : Industrial War Plans. V : Supply. Engineering and Research work is conducted by the Air Service Engineering Division at McCook Field, Dayton, Ohio. The Air Service Medical Section operates a School of Aviation Medicine at Mitchel Field, Long Island, from which flight surgeons are detached to the various Air Service Stations.

The present reduced strength organization of the U.S. Air Service comprises :—

(*a*) A reduced strength Division Air Service placed in each corps area and under the orders of the corps area commander. This consists of an observation squadron and a photo section that co-operate with any service schools in the corps area, furnish Air Service for summer training camps, make mosaics and general aerial photographs, lend co-operation in manœuvres and, in general, perform any missions that the corps area commander may assign.

(*b*) A minimum of Air Force tactical units, namely :—
1 Attack Group ;
1 Bombardment Group ;
1 Pursuit Group.

These tactical units must develop the tactics used in the three types of squadrons of the Air Force ; they must act as the main fighting component of the regular Air Service in minor emergencies ; they constitute the offensive component of our regular Air Service.

(*c*) A number of Special Service Schools and school troops as follows :—
Primary Flying School, Brooks Field, San Antonio, Tex.
Advanced Flying School, Kelly Field, San Antonio, Tex.
Balloon and Airship School, Scott Field, Belleville, Ill.
Technical School, Chanute Field, Rantoul, Ill.
Field Officers School, Langley Field, Hampton, Va.
190 Flying Cadets.

CORPS AREA AND DEPARTMENT AIR OFFICES.

1st Corps Area—Army Base, South Boston, Mass.
2nd Corps Area—Governor's Island, N.Y.
3rd Corps Area—Baltimore, Md.
4th Corps Area—Atlanta, Georgia.
5th Corps Area—Fort Hayes, Columbus, Ohio.
6th Corps Area—Chicago, Ill.
7th Corps Area—Omaha, Nebraska.
8th Corps Area—Fort Sam Houston, Texas.
9th Corps Area—Presidio of San Francisco, Calif.
The Hawaiian Department—Honolulu.
The Panama Canal Department—Quarry Heights, Balboa Heights, Canal Zone.
The Philippine Department—Manilla, P.I.

AIR SERVICE STATIONS AND TROOPS.

The present distribution of the reduced strength Air Service, up to Dec. 1, 1923, by station, is as follows :—

Akron, Ohio.
District Office, Balloon Production and Inspection Procurement Section.

Brooks Field, San Antonio, Texas.
11th School Group Headquarters.
46th and 47th School Squadrons.
24th Photo Section.
62nd Service Squadron.
Primary Flying School.
Flying Cadet Detachment.

Bolling Field, Anacostia, D.C.
Headquarters Detachment, 3rd Photo Section.
99th Observation Squadron (R.S.).
56th Service Squadron (R.S.).

Boston Air Port, Boston, Mass.
Corps Area Headquarters Flight.

Brown, Fort, Fort Brown, Texas.
Border Patrol Station.

Bliss, Fort, El Paso, Texas.
1st Photo Section.
12th Observation Squadron (R.S.).
32nd Air Intelligence Section.
Border Patrol.
(Detachments of 12th Observation Squadron on duty at Nogales and Douglas, Arizona and Camps Bierne and Marfa, Texas.)

Chanute Field, Rantoul, Illinois.
5th Photo Section.
15th Observation Squadron (R.S.).
Technical School.

Clark Field, Camp Stotsenburg, Philippine Islands.
3rd Pursuit Squadron.

Crissy Field, Presidio of San Francisco, California.
33rd Air Intelligence Section.
91st Observation Squadron.
15th Photo Section.
Aerial Coast Defence.
Forest Patrol.

Crook, Fort, Fort Crook, Nebraska.
Corps Area Headquarters Flight.

Fairfield Air Intermediate Depot, Wilbur Wright Field, Fairfield Ohio.
88th Observation Squadron (R.S.).
7th Photo Section.
Supply and Repair Depot.
Field Service Section.

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UNITED STATES—*continued.*

Kelly Field, Texas.
1st Wing Headquarters.
3rd Attack Group Headquarters.
8th Attack Squadron.
13th Attack Squadron.
26th Attack Squadron.
90th Attack Squadron.
10th School Group Headquarters.
40th School Squadron.
41st School Squadron.
42nd School Squadron.
43rd School Squadron.
60th Service Squadron.
68th School Squadron.
22nd Photo Section.
Flying Cadet Detachment.
Flying Field.
Advanced Flying School.
(Detachments of 8th, 13th, 26th and 90th Attack Squadrons on duty at McAllen, Laredo, Del Rio and Sanderson, Texas.)

Langley Field, Hampton, Va.
2nd Wing Headquarters.
50th Observation Squadron (R.S.).
19th Airship Co.
2nd Bombing Group Headquarters.
11th Bombing Squadron.
20th Bombing Squadron.
96th Bombing Squadron.
58th Service Squadron (R.S.).
59th Service Squadron.
2nd Photo Section.
20th Photo Section.
Tactical School.

Little Rock Air Intermediate Depot, Little Rock, Arkansas.
Supply Depot.

McCook Field, Dayton, Ohio.
Engineering Division.
Engineering School.

Maxwell Field, Montgomery Alabama.
22nd Observation Squadron.
4th Photo Section.

Michel Field, Long Island, New York.
9th Observation Group Headquarters.
8th and 14th Photo Section.
1st Observation Squadron (R.S.).
5th Observation Squadron (R.S.).
31st Air Intelligence Section.
61st Service Squadron.
School of Aviation Medicine.

Middletown Air Intermediate Depot, Middletown, Pa.
Supply Depot.
Industrial War Plans Section.

Norton Field, Columbus, Ohio.
Corps Area Headquarters Flight.

Phillips Field, Aberdeen Proving Ground, Maryland.
18th Airship Co. (R.S.).
49th Bombing Squadron.
Ordnance Proving Ground.

Pope Field, Fayetteville, N. C.
Detachment 22nd Observation Squadron.

Riley, Fort, Kansas.
16th Observation Squadron (R.S.).
9th Photo Section.

Rockwell Air Intermediate Depot, Rockwell Field, Coronado, California.
Supply and Repair Depot.

San Antonio Intermediate Depot, San Antonio, Texas.
Supply and Repair Depot.

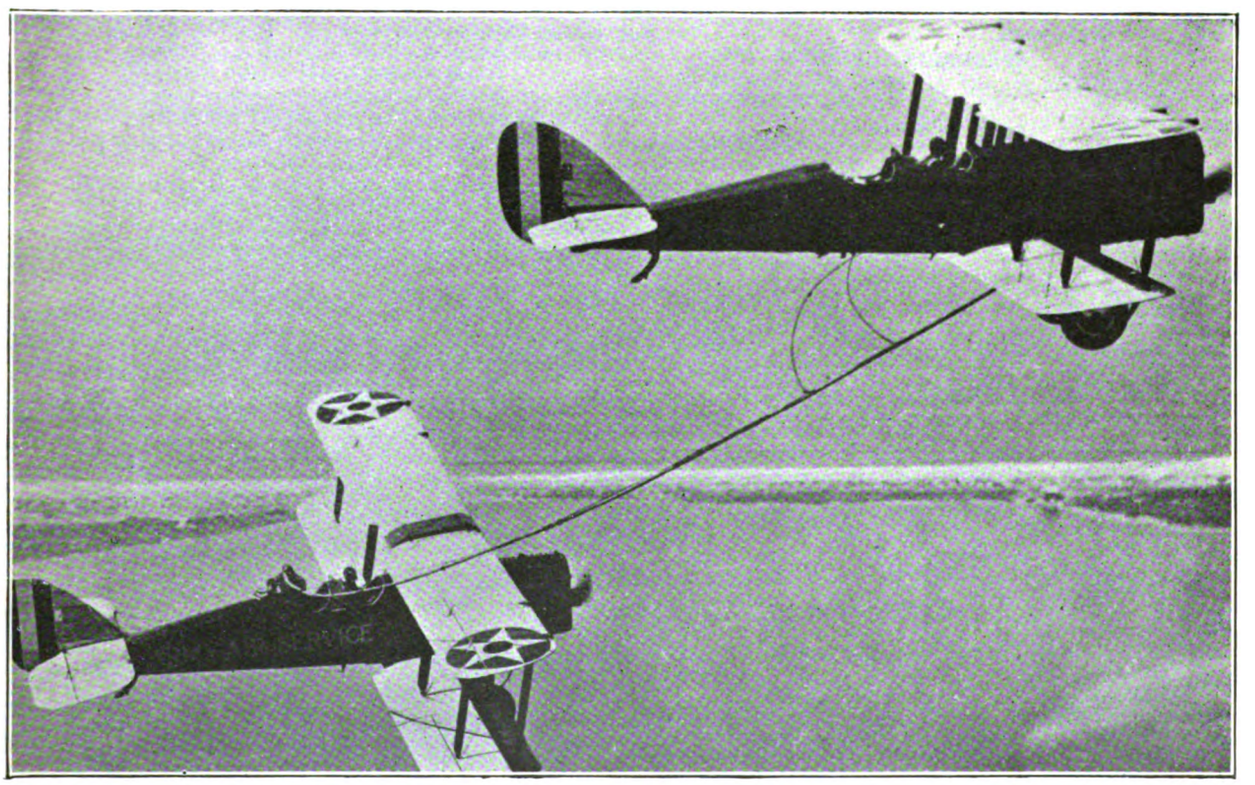
Scott Field, Ill.
8th Airship Company.
9th Airship Company.
12th Airship Company
21st Airship Group Headquarters.
21st Photo Section.
24th Airship Service Co.
Balloon and Airship School.
Air Intermediate Depot.

Selfridge Field, Mount Clemens, Michigan.
1st Pursuit Group Headquarters.
57th Service Squadron.
17th Pursuit Squadron.
27th Pursuit Squadron.
94th Pursuit Squadron.
95th Pursuit Squadron.

Sheridan, Fort, Fort Sheridan, Illinois.
Corps Area Headquarters Flight.

Sill, Fort, Oklahoma.
44th Observation Squadron (R.S.).
23rd Photo Section.
Field Artillery School.

France Field, Panama, Canal Zone.
6th Composite Group Headquarters.
7th Observation Squadron.
12th Photo Section.
40th Air Intelligence Section.
63rd Service Squadron.



U.S. Army Aviators re-fuelling one machine from another while flying.

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UNITED STATES—*continued.*

24th Pursuit Squadron.
25th Bombing Squadron.
Aerial Coast Defence.

Kindley Field, Fort Mills, Philippine Islands.
2nd Observation Squadron.

Luke Field, Honolulu, Hawaii.
5th Composite Group Headquarters.
6th Pursuit Squadron.
65th Service Squadron.
11th Photo Section.
41st Air Intelligence Section.
23rd Bombing Squadron.
Aerial Coast Defence.
72nd Bombing Squadron.
19th Pursuit Squadron.

Nichols, Camp, Rizal, Philippine Islands.
4th Composite Group Headquarters.
66th Service Squadron.
6th Photo Section.
42nd Air Intelligence Section.
28th Bombing Squadron.
Philippine Air Depot.

Wheeler Field, Schofield Barracks, Honolulu, Hawaii.
4th Observation Squadron.
Aerial Coast Defence.
Headquarters 17th Composite Group.

AIR SERVICE INTERMEDIATE LANDING GROUNDS.

Bowman Field, Louisville, Ky.
Clover Field, Santa Monica, Calif.
Fort Douglas, Utah.
Grisard Field, Concinnatti, Ohio.
Langin Field, Moundsville, W. P. A.
Logan Field, Dundalk, Md.
Pittsburgh Air Port, Pittsburg, Pa.
Richardsfield, Kansas City, Mo.
Sand Point, Wash.
Shoen Field, Fort Benjamin Harrison, Ind.

NATIONAL GUARD AIR SERVICE.

There are now organized and federally recognized the following National Guard Air Squadrons :—
101st Squadron, New York N.G.—Miller Field, New York.
102nd Squadron, Mass. N.G.—Boston Airport.
104th Squadron, Maryland N.G.—Logan Field, Baltimore.
135th Squadron, Alabama N.G.—Birmingham, Ala.
136th Squadron, Tennessee N.G.—Nashville, Tenn.
137th Squadron, Indiana N.G.—Wilber Fagley Field, Kokomo.
The strength of these squadrons varies from 80 to 120 officers and enlisted men.

AIR SERVICE OFFICERS RESERVE CORPS.

The Air Service Officers' Reserve Corps numbered on June 30, 1923, 8,249 members. Of this total, 5,640 hold flying ratings, 5,499 as aeroplane pilots or observers and 141 as balloon and airship pilots or observers.

APPROPRIATIONS.

The appropriation for the Air Service, provided for in the Army Estimates for 1923-4, is $12,426,000. For the year 1924-25 the sum of $12,435,000 is asked.
The Army Air Service is so short of up-to-date equipment that it is seeking an emergency appropriation to institute a definite aircraft construction programme spread over a number of years, probably five.

NAVAL AVIATION.

U.S. Naval Aviation, as the American Naval Air Service is officially designated, was re-organised in the summer of 1921, by a General Order, which created the Bureau of Aeronautics in the Navy Department and placed the service under an Admiral. The Chief of Naval Aviation is Rear-Admiral William A. Moffett.
The following organization has carried on the duties devolving upon the Bureau of Aeronautics since its establishment :—
(1) The chief of bureau.
(2) The assistant chief of bureau.
(3) Four principal divisions : (*a*) Plans. (*b*) Administration. (*c*) Material. (*d*) Flight.

NAVAL AIRCRAFT SQUADRONS.

On June 17th, 1922, the Chief of Naval Operations issued a revision of the organization of naval aviation ; this revision changed the names of the air squadrons, Atlantic Fleet and Pacific Fleet, to aircraft squadrons, scouting fleet and aircraft squadrons, battle fleet, respectively. In addition to the change in titles there were also changes in the composition of these two organizations. The names of the squadrons assigned to each fleet under this order are as follows :—

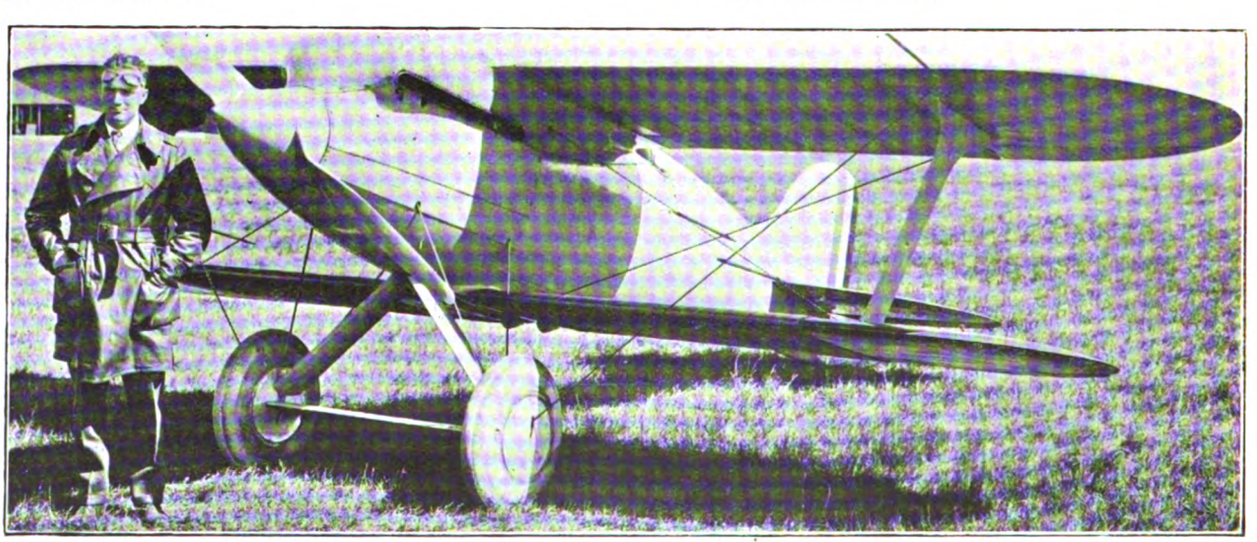
Aircraft squadrons, scouting fleet :—
Scouting Plane Squadron 1.
Torpedo and Bombing Plane Squadron 1.
Kite Balloon Squadron 1.

Aircraft squadrons, battle fleet :—
Torpedo and Bombing Plane Squadron 2.
Observation Plane Squadron 1.
Observation Plane Squadron 2.
Observation Plane Squadron 3.
Fighting Plane Squadron 1.
Fighting Plane Squadron 2.
Fighting Plane Squadron 3.

The service designation of these squadrons is as follows :—
VF—Fighting Planes.
VO—Observation Planes.
VS—Scouting Planes.
VT—Torpedo and Bombing Planes.
ZK—Kite Balloons.
The Aircraft Squadron is the standard administrative and tactical unit in all naval air operations ; it is composed of eighteen planes and sub-divided into three divisions of six planes each. Aircraft Squadrons are commanded by Naval Aviators of the Line or of the Marine Corps.
The planes of the Aircraft Squadrons are designed by the number and type letters of the squadron and by their serial number in the squadron, thus :—3-F-5 (Plane No. 5 of the 3rd Fighting Squadron).

AIR BASES AND AIR STATIONS.

Throughout the year the following aviation shore establish ments were maintained :—
(1) Fleet aircraft bases :—
Naval Air Station, San Diego, Calif.
Naval Air Station, Hampton Roads, Va.
Naval Air Station, Coco Solo, Canal Zone. } In reserve
Naval Air Station, Pearl Harbor, Hawaii. } status
(2) For training personnel for aeronautic duty :—
Naval Air Station, Pensacola, Fla.
Aviation Mechanics' School, Great Lakes, Ill.
Post Graduate Detail.



Lieut. (j.g.) A. Williams, U.S.N., winner of the 1923 Pulitzer Trophy and holder of the World's Speed Record of 266 m.p.h., standing in front of the Curtiss Navy Racer (500 h.p. Curtiss D.12 engine).

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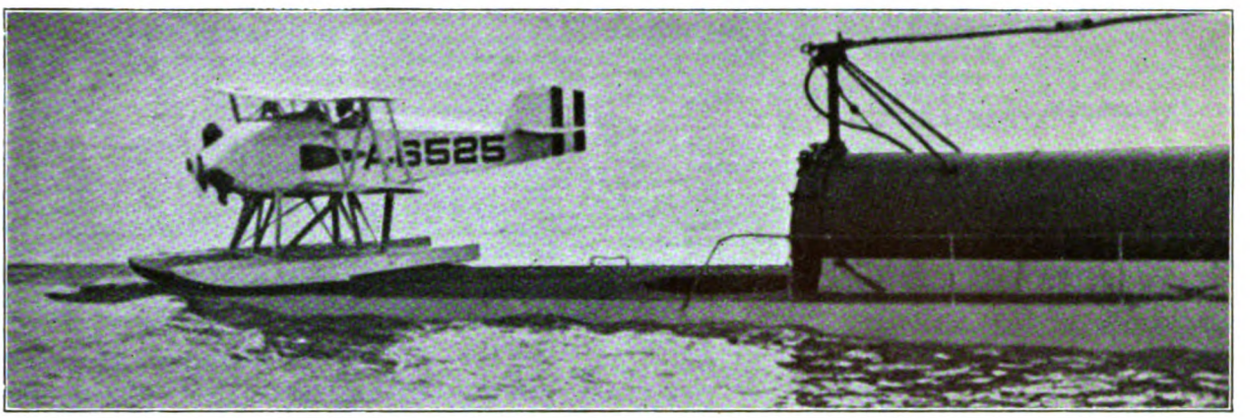
UNITED STATES—*continued.*



A U.S. Navy Scout Seaplane designed to fold up and be carried in a submarine.

(3) Inactive Coastal Patrol Stations :-
Naval Air Station, Chatham, Mass.
Naval Air Station, Cape May, N. J.
Naval Air Station, Rockaway, Long Island, N. Y.
(4) Miscellaneous :—
Naval Air Station, Anacostia, D. C. (for experimental work).
Naval Air Station, Lakehurst, N. J. (rigid airship construction).
Naval Aircraft Factory, Philadelphia, Pa.
Naval Air Detail, Newport, R. I. (experimental torpedo work).
Naval Air Detail, Dahlgren, Va. (experimental torpedo work).
(5) An inspection service covering all production and aircraft accessories manufacturing plants under contract to the Government.
(6) Helium plant at Fort Worth, Tex., operated in conjunction with United States Army Air Service.

At most naval air stations a number of planes is available for "general utility"; at the Fleet Air Bases from four to eight planes; at Anacostia, nine; at Pensacola, one hundred; and at Lakehurst, one non-rigid airship and three free balloons.

PERSONNEL STRENGTH.

On July 1, 1923, the personnel strength of the U.S. Naval Aviation was 600 officers (of whom 375 pilots) and 3,761 other ranks.

AIRCRAFT PROCURED DURING 1922-23.

During the past fiscal year about 300 heavier-than-air and 15 lighter-than-air craft were procured from domestic and foreign manufacturers, as well as from the Naval Aircraft Factory, and about 200 aircraft were on order.

The planes of foreign manufacture included the following makes :—Fokker, Macchi, Morane-Saulnier, Blackburn, Dornier, Vickers, Parnall, Handley-Page and Caspar (Heinkel).

NAVAL AIR APPROPRIATIONS.

The Appropriation Bill for the Naval Service for the year ending June 30, 1923, carried under the appropriation, "Aviation, Navy" a total of $14,683,950. In addition there was available to the Naval Bureau of Aeronautics money under the 1922 appropriation to complete work authorized at naval establishments. Expenditures on this work were $751,681.71; expenditures and obligations under the appropriation, "Aviation, Navy, 1923," were $14,489,897.10, making the total cost of naval aviation under the Bureau of Aeronautics, $15,241,515.81.

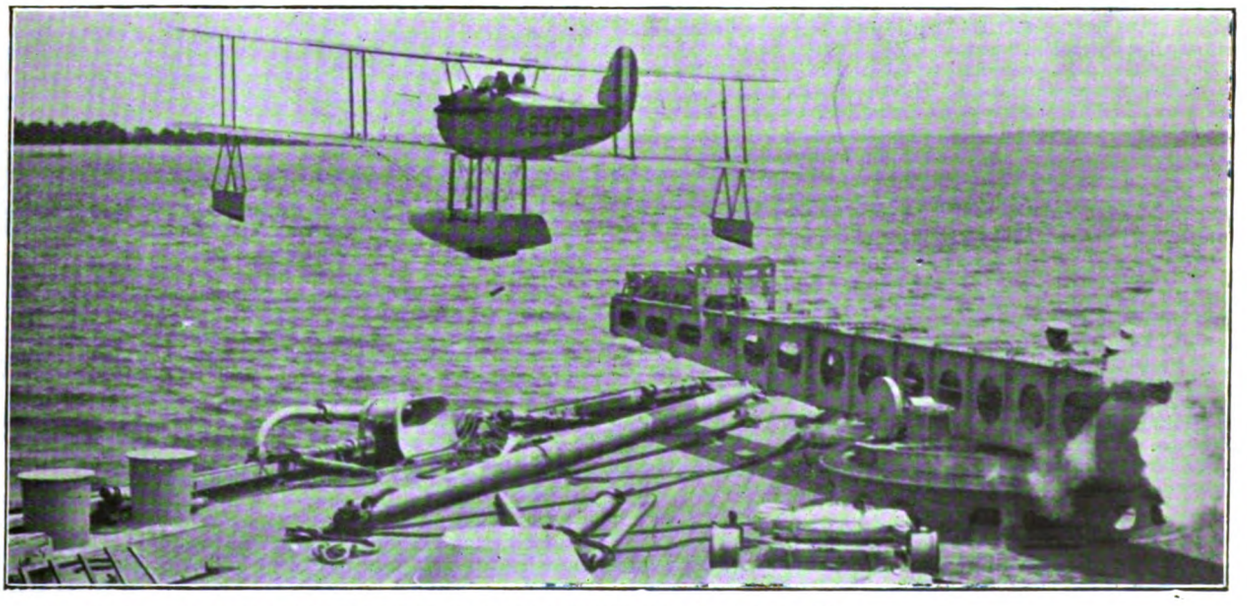
For the fiscal year 1924-25 the sum of $15,000,000 is asked.

EXPERIMENTAL AND RESEARCH WORK.

Experimental work during the past year has been along the following lines :—

Metal construction for aeroplanes.—Progress has been made during the year in metal construction, although the high cost of this type construction and the various problems incidental to metal construction have prevented rapid advancement. Several contracts have been let to manufacturers for the building of all-metal and composite aeroplanes and for the construction in metal of various aeroplane units. The naval aircraft factory is building an all-metal aeroplane and several types of metal floats in addition to the metal construction with rigid airships. Several representative metal aeroplanes from foreign manufacturers have been obtained to study methods of construction, and this information has been made available to the industry. The use of metal hulls for boat seaplanes offers particularly attractive possibilities.

Metal propellers.—The possibilities of the use of steel and duralumin propellers have been investigated, and contracts for experimental propellers entered into. Several have been used in flight, and sufficient success experienced to warrant continued experimentations.



A U.S. Naval Aeroplane being launched by catapult from the deck of a warship.

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UNITED STATES—*continued.*

Launching and arresting.—The experimentation in connection with the launching and arresting of planes on shipboard has been continued throughout the year. Arresting problems have been investigated on the U.S.S. *Langley* and the experimental turntable at Hampton Roads. Catapults are already installed on several battleships and cruisers.

AIRCRAFT POWER PLANTS.

One of the outstanding results of the past year's work has been the decision to abandon definitely the use of water-cooled engines of less than 300 h.p. in future naval aircraft construction. Development of direct air-cooled engines, and particularly of the Wright-Lawrance model J1 200 h.p. engine, has progressed rapidly during the past year, and engines of this type are quickly taking their place in service.

U.S. MARINE CORPS AVIATION.

ORGANISATION.

The United States Marine Corps Aviation has the following organisation :—

First Aviation Group.—Headquarters : Quantico, Virginia.
Observation lane Squadron 3.
Fighting Plane Squadron 1.
Kite Balloon Squadron 1.
Observation Plane Squadron 1.—Santo Domingo, D.R.
Observation Plane Squadron 2.—Port-au-Prince, Haiti.
Scouting Plane Squadron 1.—Sumay, Guam, Mariane Islands.
Marine Coastal Air Station.—Parris Island, S.C. (inactive).

PERSONNEL STRENGTH.

The personnel strength of the Marine Corps Aviation was on July 1, 1923, 58 officers and 712 enlisted men.

SUMMARY OF FIVE YEARS' AIR MAIL OPERATIONS.

Statement of performance from May 15th, 1918, the date of establishment, to Dec. 31st, 1923.

Month	Trips possible (scheduled)	Trips defaulted	Trips attempted	Trips uncompleted	Weather encountered: Trips in fog, etc.	Weather encountered: Trips clear	Mileage possible (scheduled)	Miles travelled with mail	Miles ferry and test	Total miles travelled	Per cent of performance	Mail carried (number of letters)	Cost of service	Forced landings Due to—: Mechanical causes	Forced landings Due to—: Other causes
1918 ..	793	32	761	...	258	535	87,042	81,898	20,650	102,548	94.09	4,720,240	$76,616.59	22	24
1919 ..	1,761	87	1,674	...	603	1,060	430,275	393,066	68,229	461,295	91.35	17,669,700	320,647.70	69	97
1920 ..	4,941	1,009	3,932	328	1,614	2,318	1,107,266	864,128	184,316	1,048,444	78.04	30,975,500	979,997.25	445	385
1921 ..	9,202	512	8,690	400	2,963	5,727	1,846,072	1,713,934	198,799	1,912,733	92.84	46,620,280	1,499,584.10	632	841
1922 ..	8,291	292	7,999	145	2,935	5,064	1,643,657	1,570,089	186,714	1,756,803	95.52	60,487,880	1,417,374.82	206	367
1923 ..	8,072	225	7,847	111	3,745	4,102	1,603,110	1,545,280	325,142	1,870,422	96.39	65,295,920	1,910,422.54	175	327
	33,060	2,157	30,903	984	12,118	18,806	6,717,422	6,168,395	983,850	7,152,245	91.83	225,769,520	6,204,643.00	1,549	2,041

New York—Washington Route inaugurated May 15, 1918 (discontinued May 31, 1921). Chicago—St. Louis Route inaugurated Aug. 16, 1920 (discontinued June 30, 1921). Twin Cities (Minneapolis and St. Paul)—Chicago Route inaugurated Dec. 1, 1920 (discontinued June 30, 1921). First leg of the New York—San Francisco Route inaugurated between Cleveland and Chicago May 15, 1919; second leg, New York to Cleveland, inaugurated July 1, 1919; third leg, Chicago to Omaha, inaugurated May 15, 1920; the last leg, Omaha to San Francisco, inaugurated Sept. 8, 1920. The Transcontinental is the only route operated by the Post Office Department.

U.S. AIR MAIL SERVICE.

The total mileage of the transcontinental route from New York to San Francisco is **2,680** miles.

The Air Mail Fleet comprises about seventy converted DH-4 aeroplanes and forty pilots.

The Air Mail appropriation for 1923-24 was $1,900,000. For 1923-24 $3,000,000 was asked and granted by Congress.

The chief development of the past year was the experimental institution of night flying between Chicago and Cheyenne, a distance of approximately 885 miles. After several months of research work, a plan was reached for lighting this airway with five beacons of 450,000,000 candle power each and as many flood lights for illuminating the runways of the main fields, in addition to thirty-four smaller beacons (5,000,000 candle power) located at all emergency fields, and finally, 5,000 candle power acetylene lights at three mile distances between these fields.

The official test of this path of light was made for four days, beginning August 21, 1923. The service was successfully operated in both directions, giving schedules of 26 hrs. 14 mins. East-bound, and 29 hrs. 38 mins. West-bound, between New York and San Francisco.

During the fiscal year 1924-25 it is proposed to put this service into regular operation.

During the past year the Air Mail Service erected a large warehouse and repair base at Maywood, Ill., where all repair and reconditioning work is now centralized.

The Maywood plant also does a certain amount of experimental work, with a view to producing an improved type of mail aeroplane. Prior to the organisation of this plant, several of the Air Mail Stations independently engaged in such work. The mail aeroplane No. 299, illustrated on this page, was thus produced by the Air Mail Station at Cleveland.

Last summer the Air Mail Service placed orders with the aircraft industry for a number of experimental mail aeroplanes specially designed for night flying. These machines, built by Aeromarine, Curtiss and Glenn L. Martin, will be found in Part B, under the names of these constructors.

Interesting experiments were conducted with an Air Mail plane equipped with a radio telephone developed by the General Electric Company, of Schenectady, N. Y., last fall. This equipment, known as the "One-Man Radiophone," is very simple to operate. Its rated output is 100 watts, and its normal range is 100 miles, although the mail plane on which it was mounted was heard from a distance of 175 miles.

CONTRACT AIR MAIL SERVICES.

Under contract with the Post Office Department, air mail services are being privately operated between Seattle, Washington and Victoria, B.C., and between New Orleans and Pilottown, La., for the purpose of expediting foreign mails.

The Seattle—Victoria service is again handled by Eddy Hubbard, 56, Roanoke Street, Seattle, who replaces the Alaska Airways Corporation. His contract calls for a maximum of twelve round trips per month, with a maximum mail load of 600 lbs. per trip.

The New Orleans—Pilottown services is effected by the Gulf Coast Air Line, Inc., with head offices at 515, Whitney Central Building, New Orleans. Its contract calls for a daily service, except Sundays, and for a maximum mail load of 500 lbs. per trip. The route is 80 miles long and is being flown with HS2L flying-boats. The mail carried from April to November, 1923, totalled 21,000 lbs.

Both of these services accelerate the delivery of mails on and from steamships.

CIVIL AERIAL TRANSPORT.

Excepting the U.S. Air Mail Service and the two private contract air mail services—which are the only air lines operating all the year round in the United States—it is very difficult to obtain accurate statistics on the operations of American Civil Aviation, for it is not subject to any Government control. The Aeronautical Chamber of Commerce of America estimates, however, that during 1923 some 600 civil pilots were actively engaged in Commercial Aviation and that their aggregate flying mileage was approximately 2,000,000 miles. The aeroplanes used in this work numbered, according to the best estimates, between 1,200 and 1,500.

Aeromarine Airways.

The Aeromarine Airways, Inc., which is the oldest American air line in existence, continued its seasonal passenger services during the past year, to wit, in Florida in the winter, and on the Great Lakes in the summer. The Company maintained a regular daily service between Cleveland and Detroit, weather permitting, during July, August and September, and ran occasional services between Key West, Fla. and Havana, and between Miami, Fla., Bimini and Nassau, B.W.I., during the winter months. On January 1, 1924, this Company had carried a total of approximately 26,000 passengers and flown about 1,000,000 passenger-miles.

Early in 1924 the Company was reorganised with new capital and its name was changed to Aeromarine Airways Corporation. Its head offices are at 220, W. 42nd Street, New York. Charles R. Redden is President and W. A. Buckner is Secretary.

The flying *materiel* of the Company consists of a number of converted F.5.L. flying-boats with twin "Liberty" engines, which carry ten passengers in addition to the crew. Most of these machines have been in service for four or five years and have given a good account of themselves. The service is not, however, very intensive.

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UNITED STATES—*continued.*

New York—Newport Air Service.

In the spring of 1923, a new air line, the New York—Newport Air Service, Inc., was established as an offshoot of the Loening Aeronautical Engineering Corporation. This air line operated on a weekend schedule between the Loening factory on the East River and 31st Street in New York and Codington Point, the Newport terminal. Some socially and financially prominent people backed this service, which sought to draw to air transport a wealthy clientele from the summer colony of Newport.

Inaugurated on June 27, 1923, the service was discontinued at the end of July, after one of its seaplanes crashed on landing at Newport, causing the death of a passenger.

Three Loening "Air Yachts," fitted with the 400 h.p. "Liberty" engine and capable of carrying four passengers at 120 m.p.h., were used on this service.

Curtiss Exhibition Company.

The Curtiss Exhibition Company of Garden City, N.Y., which handles all commercial flying for the Curtiss Aeroplane and Motor Company, flew a total of 125,000 miles in 1923, as against 67,600 miles in 1922. Of the former mileage, 92% was paid commercial flying. The Company operated nine Orioles, three Standards (C6 engine) and six JN4's.

The work of the Company included flying instruction (20%), aerial photography (21%), joy-riding (10%), testing and student soloing (4%) and special work, such as transportation of films and newspaper pictures, moving picture contracts, etc. (45%).

During the past year a new plan of flying instruction was inaugurated, under which the graduates of the school are given a JN4 aeroplane free, minus the engine. Large Government sales of OX5 motors reduced their price to such low figures so that students could both learn to fly and acquire a machine at a relatively small cost. Thirty pilots were turned out under this plan.

The transportation of films and newspaper pictures received a strong impetus from the various big prize fights, such as the Dempsey-Gibbons and Dempsey-Firpo fights, pictures of which were distributed from coast to coast under a special aeroplane relay service organized by the Curtiss Exhibition Company, together with several allied concerns.

The Company also furnished three Orioles and the necessary technical organisation to the Balsams Air Service, which effected a daily newspaper delivery between Garden City, L.I. and Dixville Notch, N.H., during the summer months. This service was established for the convenience of patrons of the two summer resorts, the leading hotels of which are under the same management. The distance between the two places is 350 miles, which the Balsams' aeroplanes covered on the average in four hours, as against 36 hours by railroad.

The Curtiss Exhibition Company, from its seaplane stations at Port Washington, L.I. and Atlantic City, also operated flying-boats. The total flying mileage of these machines was 26,000 miles, 96% of which consisted of sightseeing trips.

The Curtiss Metropolitan Airplane Company of New York and Miami operated in the winter months of 1923 a successful newspaper delivery service between Miami and West Palm Beach, a distance of 70 miles. Passengers were also carried on occasion. The total distance flown was 7,280 miles.

Skywriting Corporation of America.

The Skywriting Corporation of America, founded early in 1923 to exploit the patents taken out by Major Jack Savage, an Englishman, to cover advertisements written in the sky with smoke, had a most successful year. Fourteen skywriting planes—specially equipped SE5A's with the "Viper" 220 h.p. engine—carried the celestial advertisements contracted for by the American Tobacco Company all over the United States and totalled about 1,800 flying hours.

The head offices of the Company are at 50, E. 42nd Street, New York, Allan J. Cameron is President of the concern.

AERIAL PHOTOGRAPHIC WORK.

Aerial photography, both vertical for map making and oblique for pictorial purposes, has been actively engaged in by several firms during the past year.

The bulk of this work was done by the Fairchild Aerial Camera Corporation, with head offices at 136, W. 52d Street, New York. Sherman M. Fairchild is President of the Company. The aeroplanes of this firm flew during 1923 a total of about 25,000 miles, of which number some 3,000 miles were flown in making a mosaic map of Greater New York, involving an area of 625 square miles.

This Company also constructs its own photographic equipment.

Underwood & Underwood, a large photographic news enterprise, of New York, added a department of aerial photography to their activities in 1923, placing Hamilton Maxwell, Inc., of 6, E. 39th Street, New York, in charge.

OTHER AERIAL ACTIVITIES.

While the number of incorporated civil aviation companies is extremely large in the United States, the volume of their work varies a great deal. There are countless "two-men-one-plane" concerns, the so-called "gypsy fliers," which travel a good deal about the country and earn a rather precarious livelihood from trick flying exhibitions and joy-riding work.

Beside these there exist, however, in most of the larger cities, small but financially and technically well-organized civil aviation companies, which carry on sound aeronautical "vulgarisation" by maintaining flying schools and aeroplane hire services.

One of these is the Yackey Aircraft Company, of Forest Park, Ill., near Chicago, which "soloed" 62 students, sold 47 aeroplanes, and was paid for 86,000 miles cross-country flying in 1923.

Similarly, the Mid-West Airways Corporation, of Monmouth, Ill., was very active last year. Its records show a total flying mileage of 13,900 miles and 571 passengers carried.

CONTROL OF CIVIL AVIATION.

Control of Civil Aviation by the Federal Government has been sought for years by the American aircraft industry, as well as by the Services. The apathy of Congress has so far thwarted these efforts.

On Januray 8, 1924, the U.S. Senate passed the modified Wadsworth Bill, providing for the creation of a Bureau of Civil Aeronautics in the Department of Commerce. Practically the same Bill was passed by the Senate in its previous session, but the House of Representatives failed to act in this matter.

A Bill of similar purport was introduced in the House by Congressman Winslow, of Massachusetts, on December 13, 1923, and Senator Wadsworth introduced it in the Senate on December 19. It is hoped that a compromise Bill embodying the best features of these two measures will eventually be passed by Congress and with the approval of the President become the Civil Aeronautic Act of the United States.

In the meantime, several States of the Union have passed, or are about to pass, legislation governing the use of aircraft. Most of these laws, however, contain a proviso whereby they would automatically lapse as soon as Federal Air Legislation comes into force.

In the absence of Federal Flying Regulations, the Underwriters' Laboratories of Chicago has created an Aeronautical Department, which issues certificates to pilots and registers aircraft as to airworthiness. The pilot certificates are delivered in accordance with the provisions of the International Convention for Air Navigation of 1919. "Resident Aviation Engineers" have been appointed in the principal flying centres for the purpose of examining aircraft for airworthiness. During the year of 1923, the Underwriters' Laboratories of Chicago entered in their Aviation Register 25 commercial aircraft and 10 private aircraft, and issued 10 Airworthiness Certificates and 39 Pilots' Certificates.

AMERICAN AIRCRAFT CARRIERS.

The following are the aircraft-carrying ships owned by the U.S. Navy :—

LEXINGTON and SARATOGA.

Were laid down as battle-cruisers, but under the Washington Treaty are to be converted into aircraft carriers.

Reported to have accommodation for 50 aircraft. To have one huge slab-sided funnel, basket mast and all superstructure mounted on extreme starboard side.

LANGLEY.

Built in 1912, as fleet-collier "Jupiter," converted to aircraft carrier in 1920-21.

Has one long uninterrupted flying deck and two horizontal smoke ducts interconnected so that smoke can be discharged on lee side. One duct has hinged extension, which can be lowered close to waterline. Smoke from the other duct can be discharged through water spray.

She was the first large ship of the U.S. Navy to be fitted with electric drive, and is also fitted with a Sperry gyro-stabiliser.

Has accommodation for 12 single-seater, 12 two-seater and 10 torpedo aircraft. Flying deck, 534 × 64 × 56 ft., and has launching catapults fitted.

Displacement : 19,360 tons.
Length, p.p. : 520 ft.
Length, o.a. : 542 ft.
Beam : 65 ft.
Draught, mean : 27¾ ft.
Guns : 4—5 in.
S.H.P. : 7,152.
Speed : 14.9 kts.
Fuel : Coal.

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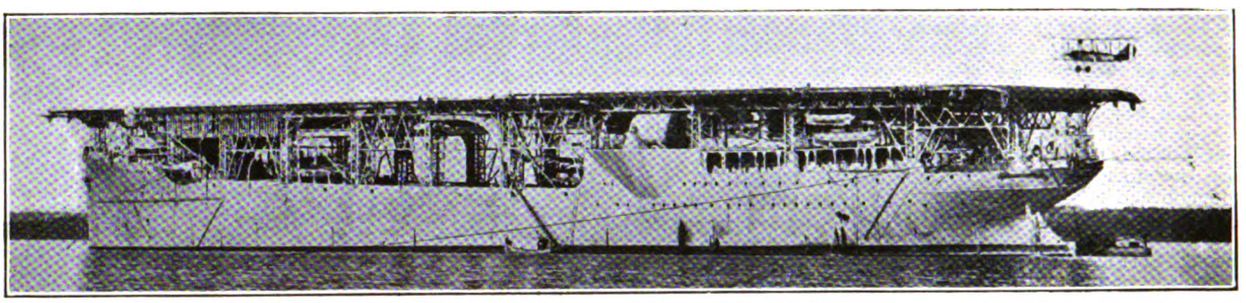
UNITED STATES—*continued.*



The U.S. Aircraft-carrier "Langley" with an aeroplane alighting on her deck.

PATOKA.

Built in 1919, as a Fleet Auxiliary and Oil Tanker. Converted in 1924, at the Norfolk Navy Yard, for duty as Airship Tender. A mooring mast has been erected aft, and there is accommodation for four seaplanes amidships.

The "Patoka," together with the "Ramapo" of the same class of ship, were to be modified as above to do duty as airship tenders and seaplane bases for the Arctic Expedition of the Shenandoah, but on postponement of this expedition the alterations to the "Ramapo" were cancelled. The "Patoka" has now been assigned to Aircraft Squadrons, Scouting Fleet, as a tender for the Naval airship "Shenandoah."

Specification as Oiler, before conversion :—

Displacement : 16,800 tons.
Length : 463¼ ft.
Beam : 60 ft.
Draught : 26¼ ft.
Guns : 2—5 in., 2—3 in. AA.
I.H.P. : 2,900.
Speed : 10.5 kts.

WRIGHT.

Launched April, 1920. Has accommodation for 6 kite balloons, with all necessary gear for handling and inflation in balloon well, aft. Also serves as tender to seaplanes, carrying spare wings. The "Wright" was commissioned on March 17, 1924, as flagship of the Aircraft Squadrons' Scouting Fleet.

Displacement : 14,240 tons.
Length : 488 ft.
Beam : 58 ft.
Draught : 31 ft.
Guns : 2—5 in., 2—3 in. A.A.
S.H.P. : 6,000.
Speed : 15 kts.
Complement : 213.

The mine sweepers "Sandpiper," "Gannet" and "Teal" serve as aircraft tenders. The destroyers "Harding" and "Mugford" have had their after torpedo tubes replaced by 1,200 gallon petrol tanks for duties as tenders to Air Fleet Detachment.

Also various patrol vessels of the "Eagle" class are attached to the Air Stations at Pensacola, Hampton Roads, Colo Solo, San Diego and Pearl Harbour.

URUGUAY.

Aerial Societies :—

Aero Club Uruguayo, Montevideo.

Aerial Journals :—

None.

Flying Grounds :—

Montevideo. (Military Flying School, Paso de Mendoza).

Nothing new has been heard of Uruguayan aviation since 1920

Some flying has been done in Uruguay by British, French, and Italian pilots who were operating commercially in the Argentine Republic.

MILITARY AVIATION.

The Government is making a serious effort at creating an aerial arm. For this purpose a number of officers are being trained at the Military Flying School.

Eight aero-engines were imported from the Argentine during 1917 for the equipment of training aeroplanes.

Four *Avros* were bought from the British Government for the School.

[The following information is from a monograph on Aviation in South America by Mr. A. K. Luke, of Glasgow, who has recently visited that continent.—C. G. G.]

Uruguay, with a population of only a million and a half, and an area of 72,210 sq. miles, is the smallest of all the South American Republics. Actually there is no Air Service, either Naval or Military, that could be called such, but the Army possess a few obsolete British and French machines, mainly used for training purposes, the purchase of the former being the result of the good pioneering work done by Major Scott, an ex-R.A.F. officer, on an Avro machine in 1919.

There is a Military Aviation School near Montevideo, and the Head of this School has just returned from a mission to France, where he purchased six new Nieuports and a quantity of spare parts to the total value of half a million francs. This may not seem a great deal, but as their standing Army only amounts to 10,000 officers and men, it is sufficient to form the nucleus of an efficient Military Air Service.

An Air Convention has been signed between the Uruguayan and Argentine Governments regulating the traffic between the two capitals, and the negotiations between the Postal Authorities of the two countries have been brought to a satisfactory conclusion. On the first trip from Buenos Aires to Montevideo, after the completion of the negotiations, 1,270 letters were carried.

The possibilities of successfully running aeroplane or seaplane services in Uruguay itself, for mail or passenger traffic, are not good. The railway and telegraph communications with the interior are admittedly bad, but on the other hand, the population in the country districts is scanty, for out of the total population of 1,500,000, a third of this is in Montevideo itself.

An international service from Montevideo to Asuncion, the Capital of Paraguay, with halts at Colonia (Uruguay), Paraña (Argentina), Corrientes (Argentina) and Formosa (Paraguay), might be a paying proposition for the future, though ambitious, I admit.

There have been no definite Aviation Missions to Uruguay, though in 1919 the French and Italian Missions to the Argentine gave exhibition flights. The Army, however, is trained on French lines, and the uniforms are almost identical with those seen in France in pre-War days, so that it can be taken that the predominating influence is French.

There are no aviation transport companies in existence yet, but tentative schemes for a service to Buenos Aires, and another to Rio Grande del Sul and Porto Alegre, have been mooted from time to time, though nothing has so far matured.

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VENEZUELA.

A FRENCH REVIEW OF PROGRESS.

MILITARY AVIATION.

The Venezuelan Military Air Service was created by decree on April 17, 1920, and a pilots' training school was established in the vicinity of Maracay, the residence of General Juan Vicente Gomez, President of the Venezuelan Republic. The Service is under the direct command of General Jose Vicente Gomez, Inspector General of the Army and is controlled by the Minister of War and Marine, Jimenez Rebolledo.

The first pilots were trained by a French Mission, comprising six members, in charge of Captain Fieschi, who arrived in Venezuela on January 7, 1921. The material comprised 16 Caudron G-3 and G-4 and Farman F-40 machines.

A large modern hangar capable of housing 15 to 20 aeroplanes was erected on the rather restricted and unsuitable ground at Maracay. The workshops are installed in another hangar and a Bessonneau hangar.

The first certificates were awarded on May 27, 1921, only two months after the courses had begun, and four officers, Lieut. Leonardi and Sub-Lieuts. Rios, Rodriguez and Heuer, were ready to form the nucleus of the Military Air Service. By October, 1921, the Mission had carried out 1,361 flights with a total flying time of 289 hours, and the pupils 1,267 flights in 245 hours, without a single accident occurring. Theoretical instruction in the workshops was also given.

At La Palmita, on the northern bank of the Lake of Valencia and 12 km. from Maracay, the Naval Aviation Centre was established with one Bessonneau hangar, a spacious manœuvring platform and a slipway 20 metres wide. The situation is extremely good, but there is an unusual amount of mirage on the lake early in the day. The first official flights from the centre took place on November 2, 1922.

The aerodromes at present in existence are those of Maracay, Caracas, Carabobo, San Juan de los Morros—a health resort, Ocumare and Puerto Cabello. Grounds at Calabozo, S. Fernando de Apure and S. Christobal can be used, and will shortly be properly laid out. It may be mentioned that the Paraiso Valley, near Caracas, is a perfect site for an aircraft base.

CIVIL AVIATION.

No steps have yet been taken for the development of civil aviation, but a general scheme for the establishment of air lines has been drawn up as follows :—

1. **Air Line in the North-South direction,** linking up Venezuela with Brazil. This line will be operated by aeroplanes and seaplanes, the latter operating the service over the mouth of the Amazon Valley.
2. **Eastern Line from S. Fernando de Apure to Bolivar City and Port of Spain, Trinidad.** This line would be operated by aeroplanes as far as Bolivar City and continued to Port of Spain by seaplanes. Here the line would make a connection with French lines from Guiana to Florida, via the chain of the Antilles.
3. **Tachira to the Colombian frontier,** passing either North or South of the Merida Cordillera, or going to Encontrados via the Coast and Maracaibo.
4. **Bolivar City towards Venezuelan Guiana,** to Guasipati on the one hand and La Paragua on the other.

These lines are important, on account of the mineral wealth of the regions which they serve.

Interviewed with respect to the future of aviation in Venezuela, Captain Fieschi stated that hydroaviation is of predominating importance, owing to the very long coast line (2,500 km.) and the number of rivers running through the most prosperous parts of the country.

In addition to this, large areas are flooded in the Orinoco Basin for several months in the year. It should be possible to carry out communications in these flood zones by seaplanes and hydroplane boats during the rainy season and by aeroplanes during other months.

The country is so little known that maps are of a most elementary nature, and no surveys exist, and exploration and photographic work by aircraft would therefore be of inestimable value.

YUGO-SLAVIA.

Officers and Men of the Yugo-Slav Military Aviation Service.

THE KINGDOM OF THE SERBS, CROATS AND SLOVENES.

After the unity of the Serbs, Croats and Slovenes had been proclaimed, a considerable number of aviators—Croats and Slovenes who had previously been in the Austro-Hungarian Army—joined the Serbian Air Force.

The training of Pilots, Observers and Mechanics will take place in the future in the Kingdom of Serbs, Croates and Slovenes, ample installations, plants and training material having been acquired in the newly united territories. This applies likewise to all other special training of personnel for aviation.

It is only intended to send Aviation Engineers abroad for specializing.

The Serbian Legation states that the plans for their Air Force have not yet been published, and that so far as they are aware there is no Civil Aviation in their country.

THE AIRCRAFT FACTORY AT NOVISAD.

A German newspaper reports that General Milan Uzelac, Commandant of the Aviation Department of the Yugo-Slav Army, Lieut.-Commander Konjovie and Captain Radovic returned in June, 1923, from a visit to England and France. These officers visited various aircraft factories and studied the conditions under which the requirements in aircraft of the Yugo-Slav Army could be met by these countries. They would, however, appear to have come to the opinion that it is more practical to erect an aircraft factory in their own country, thereby making themselves independent of foreign countries, and have consequently worked out a plan for this purpose which was to be submitted to the Ministry of War.

So far, the French Hanriot Factory, the Russian Lebedeff Aircraft Works (now working in France), the Broder Waggonfabrik and the Novisad firm of Protic and Company, have tendered for the erection and operation of an aircraft factory at Novisad.

It is also known that a number of Dewoitine monoplanes were delivered to the Yugo-Slav Army early in 1924, and that as the result of a Mission sent to Novisad by the Breguet Co., the Yugo-Slav Government have purchased 100 Breguet XIXA 2's for their Military Service.

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PART B.

ALL THE WORLD'S AEROPLANES.

INTRODUCTORY NOTE.

In the pages which follow, all those countries which are known to have produced aeroplanes within the past year are placed in alphabetical order, and the machines built therein are described and illustrated.

A large number of countries, however, have not produced indigenous aircraft and have been omitted from their proper places. A list of these countries, and a statement as to their inactivity, is given below.

The actual work done by aircraft in these countries is described in the Historical Section of this volume.

It may safely be assumed that any country not included in the list below or in the main part of this section, whether it be newly discovered or self-determined between the period of writing and the publication of this volume, does not possess any aircraft manufacturers.

COUNTRIES NOT KNOWN TO BUILD AIRCRAFT.

ARGENTINA.
There is no record of any aircraft having been constructed in Argentina.

BOLIVIA.
No aircraft manufacturers are known to exist in this country.

BRAZIL.
No aircraft factories exist in Brazil.

BULGARIA.
Does not possess any aircraft factories.

UNITED STATES OF COLOMBIA.
Has no aircraft manufacturers.

CHILE.
Has no aircraft manufacturers

CHINA.
The Foochow Dock & Engineering Works, Foochow, built in 1921 the seaplane described in the 1922 volume. No record of further aircraft construction in China is to hand.

CUBA.
Has no aircraft manufacturers.

ECUADOR.
Has no aircraft manufacturers.

ESTHONIA.
Has no aircraft manufacturers.

GREECE.
Has no aircraft manufacturers.

GUATEMALA.
Has no aircraft manufacturers

HONDURAS.
Has no aircraft manufacturers.

LATVIA.
So far as is known, there is no truly indigenous aircraft industry. But it is reported that machines of German design are being built in this country.

NICARAGUA.
Has no aircraft factories.

NORWAY.
The Government Naval Seaplane Factory and the Army Aeroplane Factory are known to have produced a small number of aeroplanes and flying-boats.
No recent data as to such products have been received.

PARAGUAY.
Has no aeroplanes.

PERU.
Has no aeroplane manufacturers.

POLAND.
Has no aircraft manufacturers.

PORTUGAL.
Has no aeroplane manufacturers.

SAN SALVADOR.
Has no aircraft factories.

SERBIA (THE KINGDOM OF THE SERBS, CROATS AND SLOVENES)
Has no aircraft factories other than Government repair shops.

SPAIN.
The Hispano-Suiza Company are reported to be building aircraft at their Guadalajara factory. A firm, by the name of Loring, of Seville, are also reported to construct aeroplanes, and licences for the production of various foreign aircraft have been secured. The Sociédad des Traficos Aeros has a licence to build Fokkers.

SIAM.
Has no aircraft factories other than Government repair-shops, but experiments in construction with indigenous timber are being made there.

TURKEY.
Has no aircraft factories. Also the Peace terms prohibit the manufacture of aircraft.

URUGUAY.
Has no aircraft manufacturers.

RUSSIA.
No technical information is available about aircraft produced in Soviet Russia, but in the Historical Section will be found an account of the activities of the Bolshevik Government, so far as information is obtainable.

VENEZUELA.
Has no aircraft manufacturers.

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AUSTRIA.

NOTE.—As a result of the dismemberment of the Austro-Hungarian Empire, and of the terms of peace imposed on the remnants by the Allies, the Austrian Aircraft Industry practically ceased to exist during the war. A considerable portion of the remnants of this industry has revived in Czecho-Slovakia, but the first sign of a revival in Austria proper is the appearance of the machine described below.

HOPFNER.

THE HOPFNER S.1.

The machine hereafter described has a special interest in view of the fact that it is said to be the first aeroplane to be constructed in Austria since the conclusion of peace. No information is available as to where the machine was built, but it has been constructed to the designs of Herr Theodor Hopfner, and is known as the Hopfner S.1.

The machine is a three-seater sport and joy-riding machine, fitted with a Fiat-built Mercedes engine of 100 h.p.

It is a simple cantilever monoplane—timber-built with no very striking features.

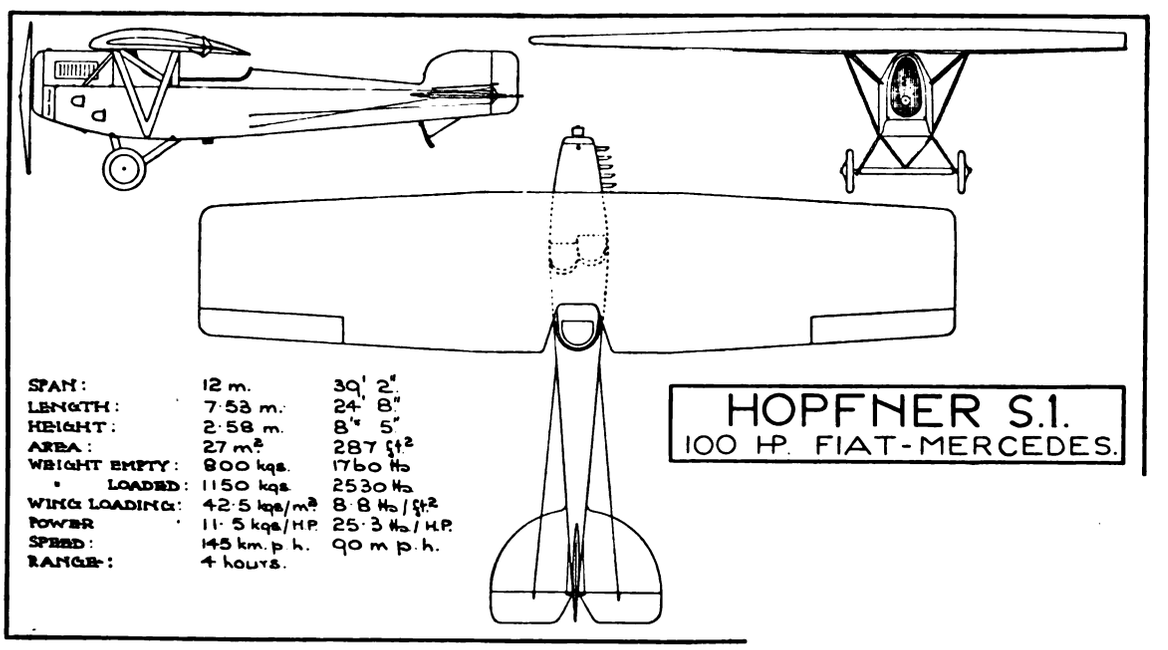
The fuselage is of rectangular section, built on four ash longerons and covered with three-ply. The engine is carried in the nose and very completely cowled in, the cowling top line being level with the lower surface of the wing and extending back past the leading edge to the front spar. There is a long open cockpit, extending from just below the front spar to the line of the trailing edge, and containing two slightly staggered seats for passengers forward, and a central seat for the pilot aft.

The wing is of a thick section supported from the fuselage on steel-tube cabanes of a form very similar to those used in the war-time Fokker cantilever machines.

The wings taper considerably both in chord and thickness, and are plywood covered.

The tail is of the normal type, and is entirely built of steel-tube fabric covered. The undercarriage is of the usual Vee type and built of faired steel tube.

Dimensions, etc., are given on the scale drawing reproduced.


HOPFNER S.1.
100 HP. FIAT-MERCEDES.
SPAN: 12 m. 39' 2"
LENGTH: 7·53 m. 24' 8"
HEIGHT: 2·58 m. 8'6" 5"
AREA: 27 m² 287 ft²
WEIGHT EMPTY: 800 kgs. 1760 lbs
LOADED: 1150 kgs 2530 lbs
WING LOADING: 42·5 kgs/m² 8·8 lbs/ft²
POWER 11·5 kgs/H.P. 25·3 lbs/H.P.
SPEED: 145 km. p h. 90 m p.h.
RANGE: 4 hours.

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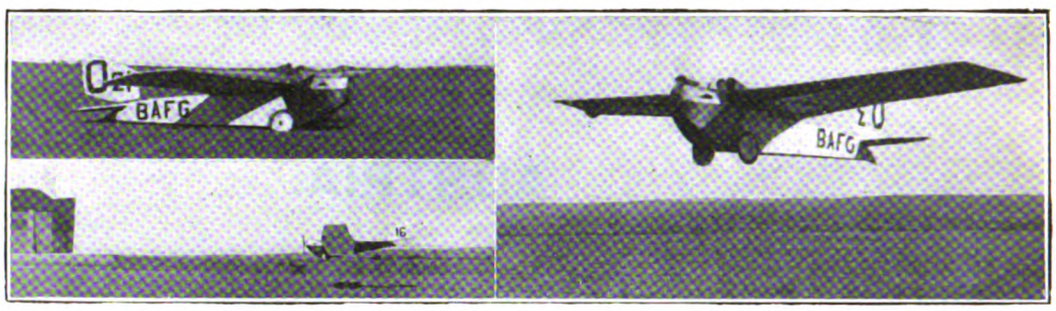
BELGIUM.



The Poncelet Light Aeroplane.

SABCA.

Société Anonyme Belge de Constructions Aéronautique. Offices: 13, Rue Bréderode, Brussels. Works: 82/108, Chaussée de Haecht, Haeren. Balloon Works: Avenue de la Liberté, Koekelberg.

The largest aeronautical works in Belgium, with a capital of 5,000,000 francs. It is associated with the Sabena (Société Anonyme Belge de Navigation Aérienn) which operates commercial air services, and the firm has a contract with the Belgian Government providing that orders to an annual minimum of 6,000,000 francs shall be placed with it.

The firm has so far mainly built types of aircraft of foreign design under licence. During 1923, their output included 30 Nieuport type 29 single-seat fighters, 15 Ansaldo type A two-seat reconnaissance machines and 24 Avro 504K two-seat training machines for the Belgian service. They hold licenses for the construction of de Havilland and Handley Page aeroplanes, and are at present building four Handley Page W.8.F. (two Siddeley "Puma" and one Rolls-Royce "Eagle" engines) for the Sabena service in the Belgian Congo.

They have also constructed successful light aeroplanes to the designs of M. Jullien, M. Poncelet and M. Cambier.

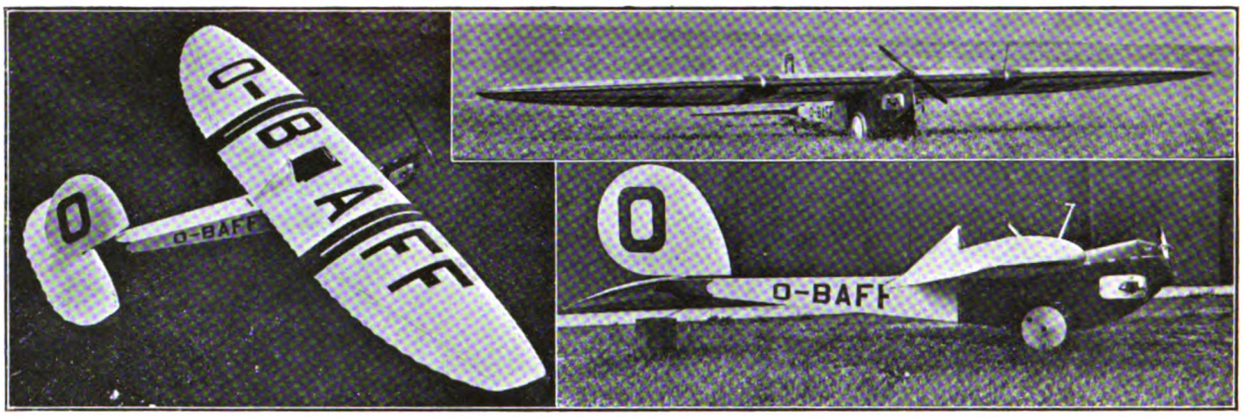
The machine has also been flown as a two-seater, the passenger being placed between the wing spars over the C.G., but it is believed that a more powerful engine will be fitted to a two-seater version.

Specification.

Span	**12.5 m. (41 ft.).**
Length	**7.5 m. (24 ft. 7 in.).**
Wing area	**24 sq. m. (256 sq. ft.).**
Weight empty	**230 kgs. (506 lbs.).**
Weight loaded	**310 kgs. (686 lbs.).**
Engine	**Sergant, 780 c.c. (17.5 b.h.p.).**
Wing loading	**12.9 kgs./sq. m. (2.68 lbs./sq. ft.).**
Power loading	**17.7 kgs./h.p. (39.2 lbs./h.p.).**

THE JULLIEN MONOPLANE.

No detailed description of this machine is available, but it is a cantilever monoplane not unlike the Poncelet described above, but equipped with a Douglas engine and a chain-driven airscrew. A later model has the Vaslin engine of 16 h.p.



The Jullien Monoplane (5 h.p. Douglas Engine).

THE PONCELET LIGHT AEROPLANE.

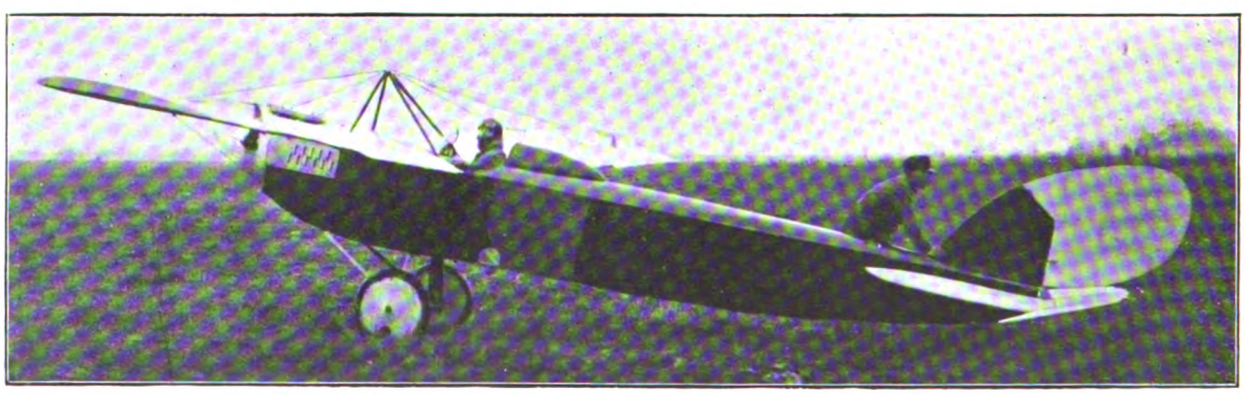
This machine was built in a form which could be used either as a glider or a light aeroplane, and took part in the French glider and light aeroplane meeting at Vauville in the summer of 1923 in both guises, but mainly as a glider. It later appeared at the British meeting at Lympne. The machine is a cantilever monoplane with a thick wing on top of the fuselage. A large cowling is built up over the main fuselage structure, to enclose the engine and the upper part of the pilot. The fuselage is entirely three-ply covered, and although of very large cross-section, appears to be both light and strong. Landing wheels are carried on axles projecting from the bottom of the fuselage. The engine is a 4-cylinder vertical air-cooled Sergant.

THE CAMBIER MONOPLANE.

This is a light braced monoplane of conventional design, also fitted with the Sergant engine. It is shown in a photograph.

Specification.

Span	10.2 m. (32 ft. 6 in.).
Length	6.0 m. (19 ft. 8 in.).
Wing area	13 sq. m. (140 sq. ft.).
Weight loaded	275 kgs. (605 lbs.).
Engine	Sergant, 780 c.c.
Wing loading	21.2 kgs./sq. m. (4.3 lbs./sq. ft.).
Power loading	14.7 kgs./h.p. (34.5 lbs.)
Max. speed	100 km.h. (62 m.p.h.).



The Cambier Monoplane (10 h.p. Sergant Engine).

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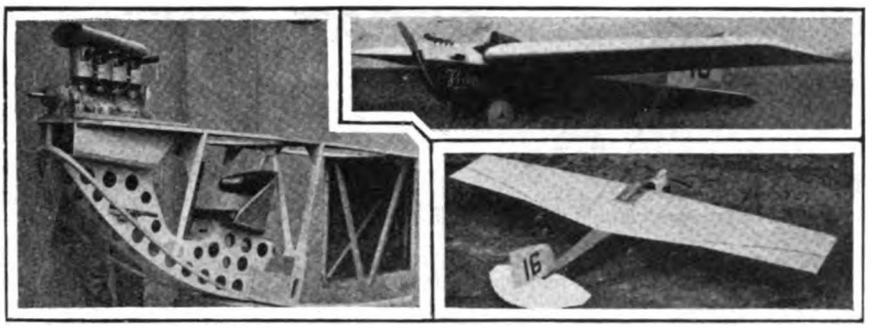
SABCA—*continued.*



The Poncelet Light Aeroplane as a Two-seater.

STAMPE & VERTONGEN.

Constructions Aeronautique J. Stampe and M. Vertongen, Deurne-Sud, Antwerp.

This firm has built training machines which are in service in the Belgian Army.

THE R.S.V. 32.90.

A two-seater with the 90 h.p. Anzani, intended for elementary training. The pupil occupies the front seat, the instructor sitting very close behind and somewhat above, so that he may be able to reach the single control lever. The instructor has a pair of rudder pedals so arranged that he can overpower the pupil's efforts on the rudder bar if necessary. The machine is a normal braced biplane of simple and robust construction, and great care has been taken to make upkeep as inexpensive as possible by standardisation of components.

Specification.

Span	**11.2 m. (36 ft. 9 in.).**
Length	**7.35 m. (24 ft. 1 in.).**
Height	**2.8 m. (9 ft. 2 in.).**
Wing area	**32 sq. m. (355 sq. ft.).**
Weight empty	**500 kgs. (1,100 lbs.).**
Weight loaded	**820 kgs. (1,804 lbs.).**
Engine	**Anzani, 90 h.p.**
Wing loading	**25.6 kgs./sq. m. (5.1 lbs./sq. ft.).**
Power loading	**9.1 kgs./h.p. (20 lbs./h.p.).**
Max. speed	**125 km.h. (78 m.p.h.).**
Climb to 1,000 m. (3,780 ft.)	**7 mins.**
Ceiling	**5,000 m. (16,400 ft.).**

THE R.S.V. 26/180.

A machine of very similar design to the previously described type, of slightly reduced area and with a 180 h.p. Hispano-Suiza engine, intended for advanced training. This machine is fitted with complete dual control and normal tandem seating.

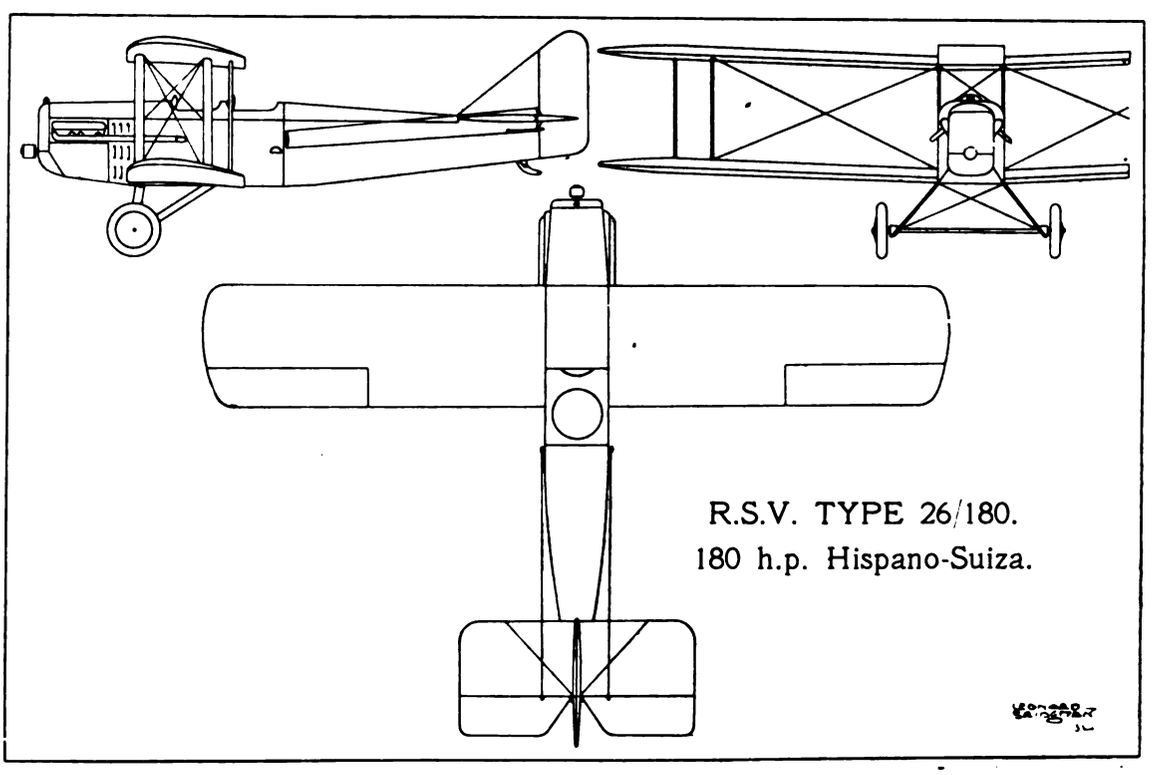
Specification.

Span	**9.38 m. (30 ft. 8 in.).**
Length	**7.15 m. (23 ft. 5 in.).**
Height	**2.8 m. (9 ft. 2 in.).**
Wing area	**26 sq. m. (278 sq. ft.).**
Weight empty	**540 kgs. (1,188 lbs.).**
Weight loaded	**821 kgs. (1,806 lbs.).**
Engine	**Hispano-Suiza, 180 h.p.**
Wing loading	**31.6 kgs./sq. m. (6.5 lbs./h.p.).**
Power loading	**4.56 kgs./h.p. (10 lbs./h.p.).**
Max. speed	**182 km.h. (113 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**2 mins. 50 secs.**
Ceiling	**7,500 m. (24,600 ft.).**

ZEEBRUGGE AERO WORKS.

Zeebrugge.

This firm, organised by Commandant Jacquet, is building an all-metal two-seater, concerning which no details are available.



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GREAT BRITAIN.

A

AIR NAVIGATION.

The Air Navigation & Engineering Co., Ltd., Addlestone, Surrey.

Formed during the War, to build Bleriot machines, by M. Norbert Chéreau, this firm built Spads and other machines for the British Air Service.

THE A.N.E.C. LIGHT AEROPLANE.

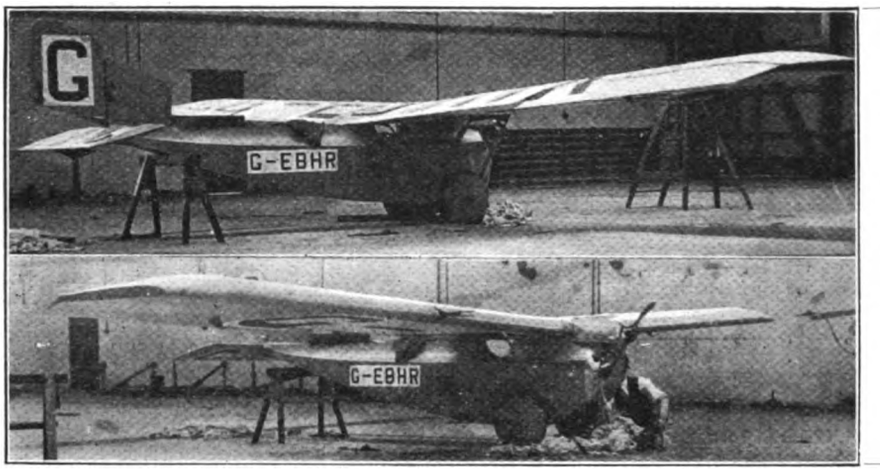
In 1922 they designed a single-seater light aeroplane to be fitted with the Bristol Cherub engine of 20 h.p., which was described in the last edition of this Annual.

be amongst the most efficient machines at that extremely successful meeting.

The machine has a number of interesting features. It is a thick-wing monoplane, with two struts from the bottom of the fuselage on each side, running out a very short way on each side. The wing is built on one single spar of triangular box section.

Another interesting feature is the shape of the fuselage. A tractor machine of this size is always difficult to arrange, because the pilot has to be behind the main part of the wing, and it is difficult to give him any reasonably good view. The narrowing down of the upper part of the fuselage, which is visible in the end elevation, allows him in this case to see forward at a small angle on each side of the centre line.

The Blackburne engine—a Vee twin—was mounted upside down on the nose of the fuselage and drove the airscrew directly.



One of the A.N.E.C. light aeroplanes is shown in this photograph.

The scale drawing below shows the original design prepared for the Bristol "Cherub" engine.

The following specification shows the minor changes of dimensions made in the Blackburne engined type:—

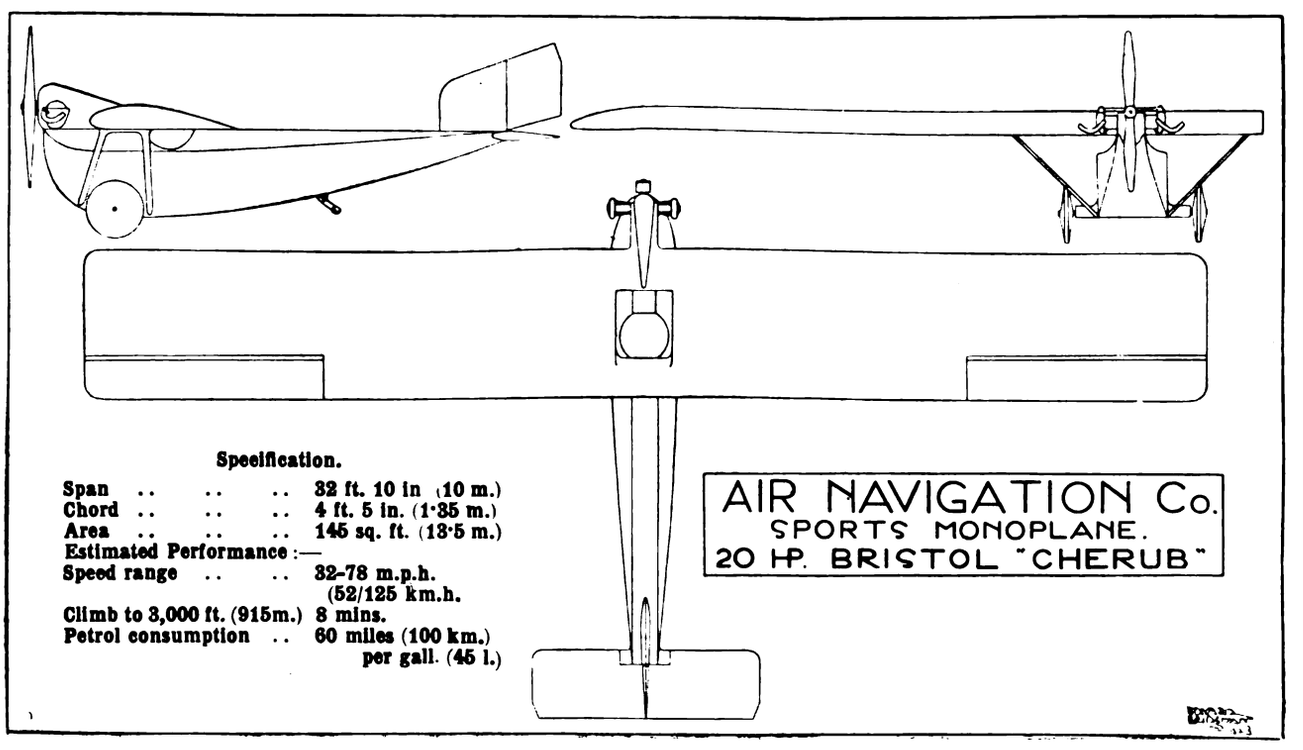
Specification.	
Span	32 ft. (9.76 m.)
Length ..	15 ft. 7 in. (4.76 m.)
Wing area ..	145 sq. ft. (13.5 m².)
Weight fully loaded ..	465 lbs. (212 k.g.)
Wing loading ..	3.21 lbs./sq. ft. (14.6 kg./m².)
Power loading (20 b.h.p.) ..	23.2 lbs./h.p. (10.6 kg./h.p.)

With minor modifications, and fitted with a Blackburne motor-cycle engine of 697 c.c. cylinder capacity (nominally 6-8 h.p.), two machines of this design were built and entered for the Light Aeroplane Competitions held at Lympne, in October, 1923. At that meeting the A.N.E.C. machines shared with another competitor the *Daily Mail* prize of £1000 by flying 87.5 miles for a fuel consumption of 1 gallon of petrol, won the prize of £200 given by Sir Chas. Wakefield for the greatest height attained by reaching 14,400 ft. and made the second highest speed of the meeting of 74 m.p.h., thus showing themselves to

The fuselage is of plywood construction, built on four longerons and a series of formers.

The undercarriage is very simple. Axle tubes, hinged at the centre line and rubber sprung at the edge of the fuselage, project some 6 inches on each side as cantilevers. The wheels are built up of wood and three-ply, with a laminated ash rim shod with a leather strip.

A two-seater light aeroplane is now being built for the Air Ministry Competitions, 1924.



Specification.

Span	32 ft. 10 in (10 m.)
Chord	4 ft. 5 in. (1·35 m.)
Area	145 sq. ft. (13·5 m.)
Estimated Performance:—	
Speed range	32-78 m.p.h. (52/125 km.h.
Climb to 3,000 ft. (915m.)	8 mins.
Petrol consumption ..	60 miles (100 km.) per gall. (45 l.)

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ARMSTRONG-WHITWORTH.

The Armstrong-Whitworth "Siskin II" (Siddeley "Jaguar" engine).

Armstrong-Whitworth Aircraft, Ltd., Parkside, Coventry.

In the summer of 1921, there appeared in the Press a report of the registration of a company bearing the title Sir W. G. Armstrong, Whitworth Aircraft Ltd. At the same period it was notified that this new concern proposed to undertake the development of aircraft of both military and commercial types.

A company has been formed, the shares whereof are held by the well-known shipbuilding and engineering firm of Sir W. G. Armstrong, Whitworth & Co., Ltd., which is known as the Armstrong Whitworth Development Company. This company in its turn holds the majority of the shares in Armstrong Whitworth Aircraft Ltd., as well as in certain other businesses.

Mr. J. D. Siddeley is Managing Director, and Mr. F. M. Green once well known at the Royal Aircraft Establishment at Farnborough is the Chief of the Aircraft Design Department.

THE "SISKIN."

The "Siskin" is a single-seater fighting aeroplane originally designed for and supplied to the British Government. It has since been modified and improved as a result of experience. It is fitted with the Armstrong Siddeley Jaguar 14-cylinder radial air-cooled engine.

The "Siskin" is of the biplane tractor type, with the top plane larger in span and in chord than the bottom plane.

The fuselage is of steel tube throughout and braced with tie rods.

The wings are of wood with hollow spars of ample section. The interplane struts are of steel and the construction is such that the aeroplane is extremely easy to erect, a minimum of trueing up being required.

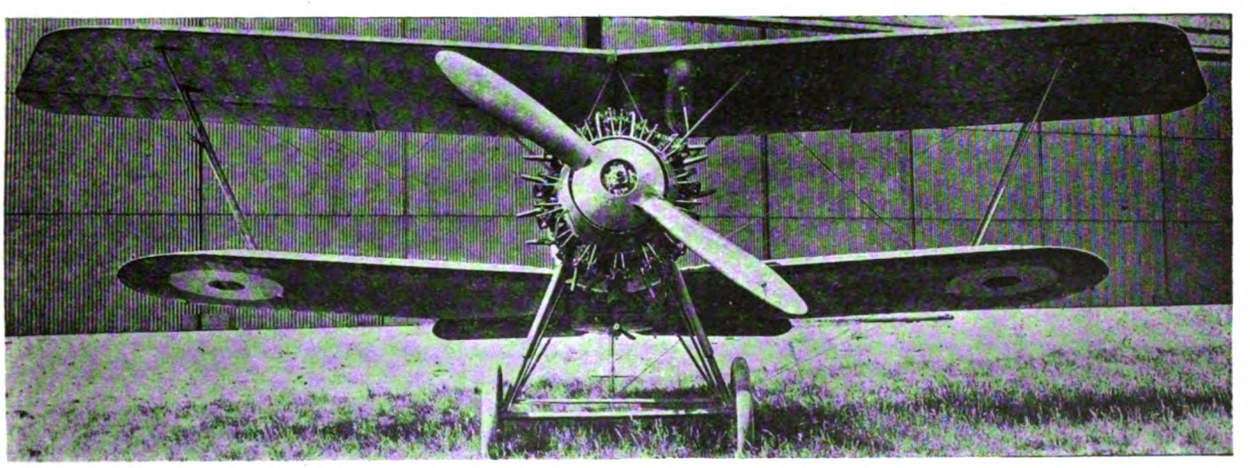
The engine is mounted on a pressed steel frame arranged so that it can be withdrawn from the aeroplane without removing the carburetter or any other of its parts. The cowling is so arranged that it remains on the engine when this is dismounted. All ordinary adjustments to the engine can be carried out without removing any of the cowling. Petrol is supplied from a gravity tank on the top of the frame containing sufficient fuel for about three-quarters of an hour. The remainder of the petrol is carried inside the body and pumped by a wind-driven pump to the gravity tank.

A fireproof bulkhead is mounted between the engine and the petrol tank and the air intakes of the carburetter are taken well outside the aeroplane.

The pilot is placed with his eye in line with the chord of the top plane so that he can see either above or below the plane. The bottom plane is of narrow chord and offers but little obstruction to view downwards. The fuselage is comparatively narrow and gives a good view over either side.

The two main guns can be carried directly over the steel tube longerons of the frame. A belt box can be fixed between the two guns with sufficient capacity to take about 2,000 rounds of small ammunition. An additional gun can be carried on the top plane.

The aeroplane is fitted with a special oleo-pneumatic landing gear designed to enable the pilot to make safe landings at slow speed without shock to the machine.



The Armstrong-Whitworth "Siskin II" (Armstrong-Siddeley "Jaguar" Engine, 350 h.p.).

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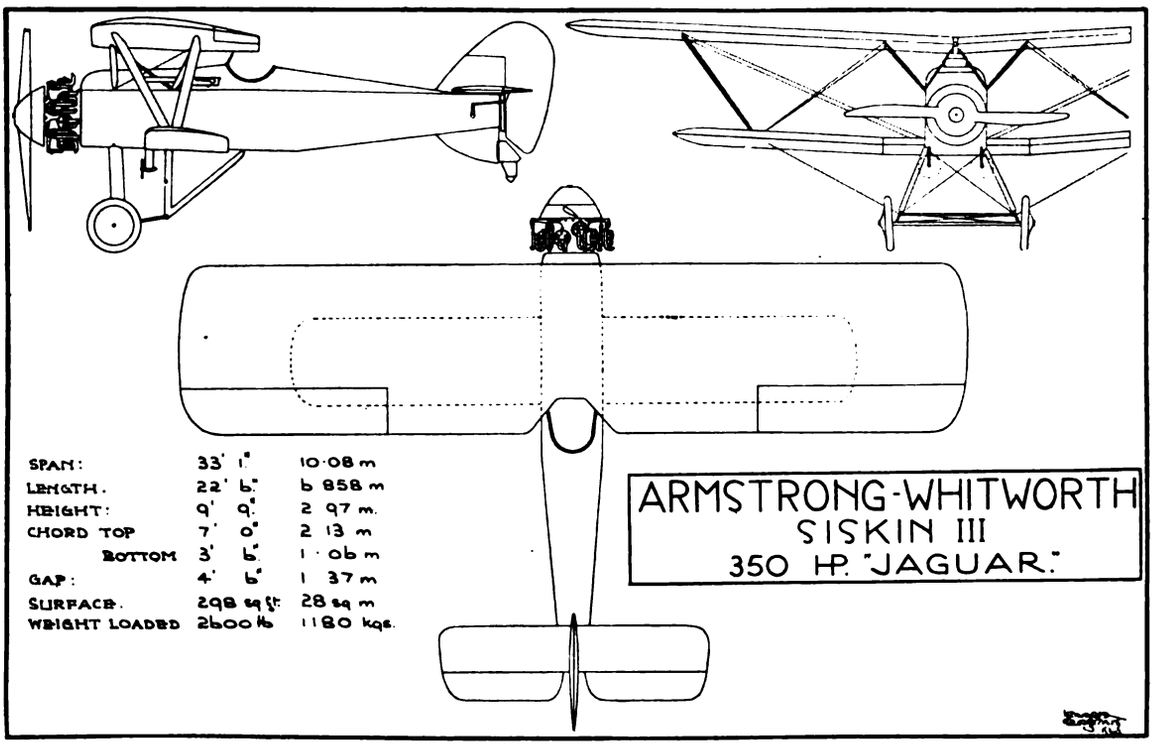
ARMSTRONG-WHITWORTH—*continued.*


SPAN: 33' 1" 10·08 m
LENGTH. 22' 6" 6 858 m
HEIGHT: 9' 9" 2 97 m.
CHORD TOP 7' 0" 2 13 m
BOTTOM 3' 6" 1·06 m
GAP: 4' 6" 1 37 m
SURFACE. 298 sq ft 28 sq m
WEIGHT LOADED 2600 lb 1180 kgs.
ARMSTRONG-WHITWORTH
SISKIN III
350 HP. "JAGUAR."

The "Siskin" has recently been built in an all-steel form to the order of the British Air Ministry. In general arrangement this machine closely resembles the original "Siskin," but no detailed account of its special features is at present permitted.

THE ARMSTRONG-WHITWORTH "AWANA."

A large troop-carrying machine designed for the Air Ministry by the Armstrong-Whitworth firm.

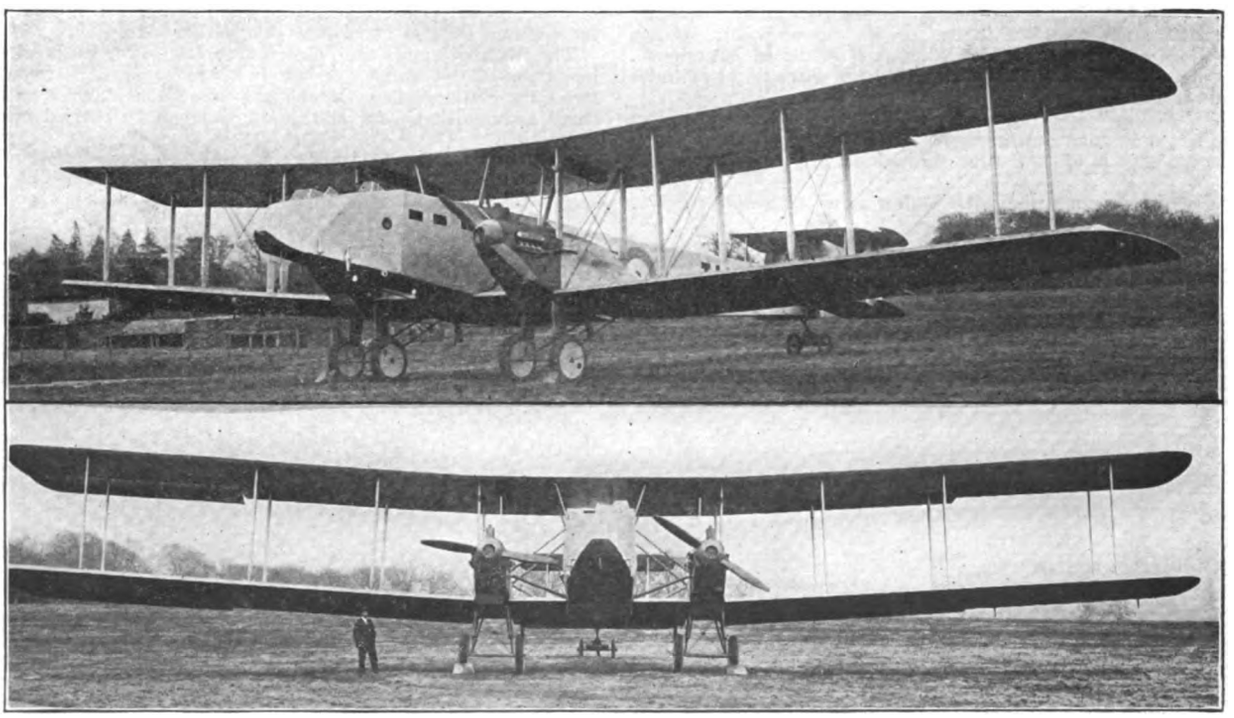
The machine is a normal twin-engined biplane of very large size, fitted with a spacious cabin in the fuselage which has accommodation for 25 men with arms and accoutrement.

The fuselage is of steel tube construction, and the roots of the lower wings, which carry the engines and are built into the fuselage, are also of steel.

The wings themselves are of normal timber construction.

Specification.

Span	**105 ft. 6 in. (32.2 m.).**
Chord, top plane	**13 ft. (3.95 m.).**
Chord, bottom plane	**10 ft. 6 in. (3.21 m.).**
Gap	**10 ft. 6 in. (3.21 m.).**
Length overall	**68 ft. (20.7 m.).**
Height	**20 ft. (6.1 m.).**
Wing area	**2,300 sq. ft. (214 sq. m.).**
Weight loaded	**17,000 lbs. (7,750 kgs.).**
Engines	**2 Napier "Lion," 450 h.p. each.**
Wing loading	**7.4 lbs./sq. ft. (36 kgs./sq. m.).**
Power loading	**18.9 lbs./h.p. (8.5 kgs./h.p.).**



The Armstrong-Whitworth "Awana" Troop Carrier (2 Napier "Lion" engines, 450 h.p. each).

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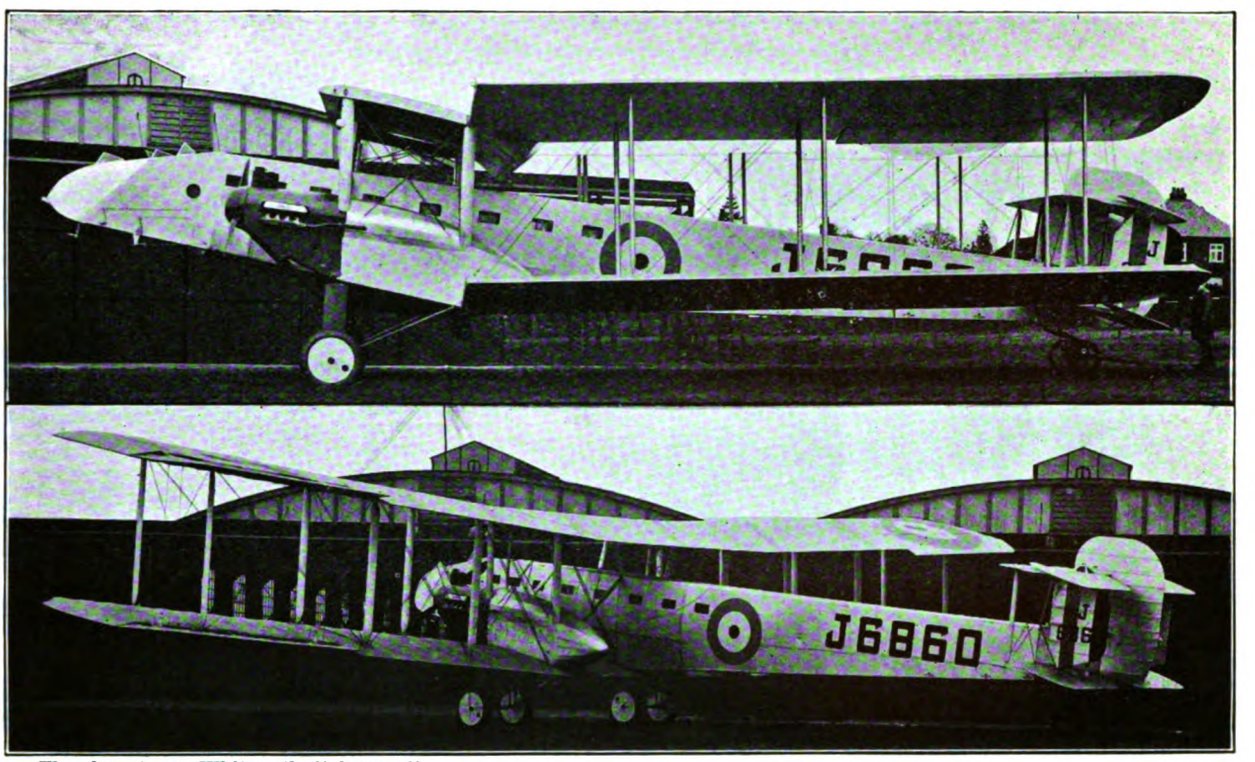
ARMSTRONG-WHITWORTH—*continued.*

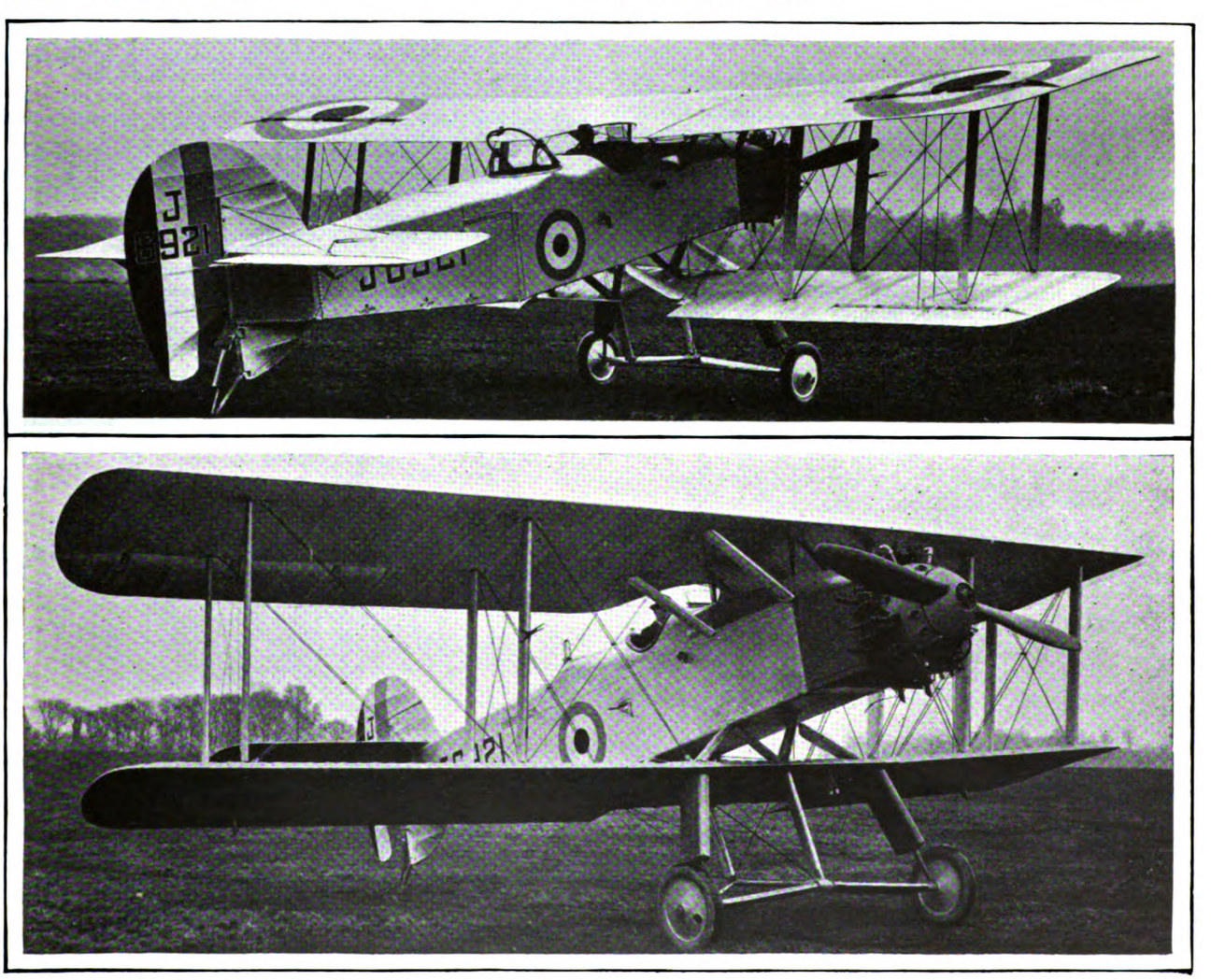


The Armstrong-Whitworth "Awana."

THE ARMSTRONG-WHITWORTH "WOLF."

During 1923 the firm produced a two-seater Corps Reconnaissance type known as the "Wolf," fitted with the "Siddeley Jaguar" engine of 370 H.P.

The general appearance of this machine is shown in photographs here reproduced, but no details may be published concerning the type.



The Armstrong-Whitworth "Wolf" (350 Armstrong Siddeley Jaguar engine).

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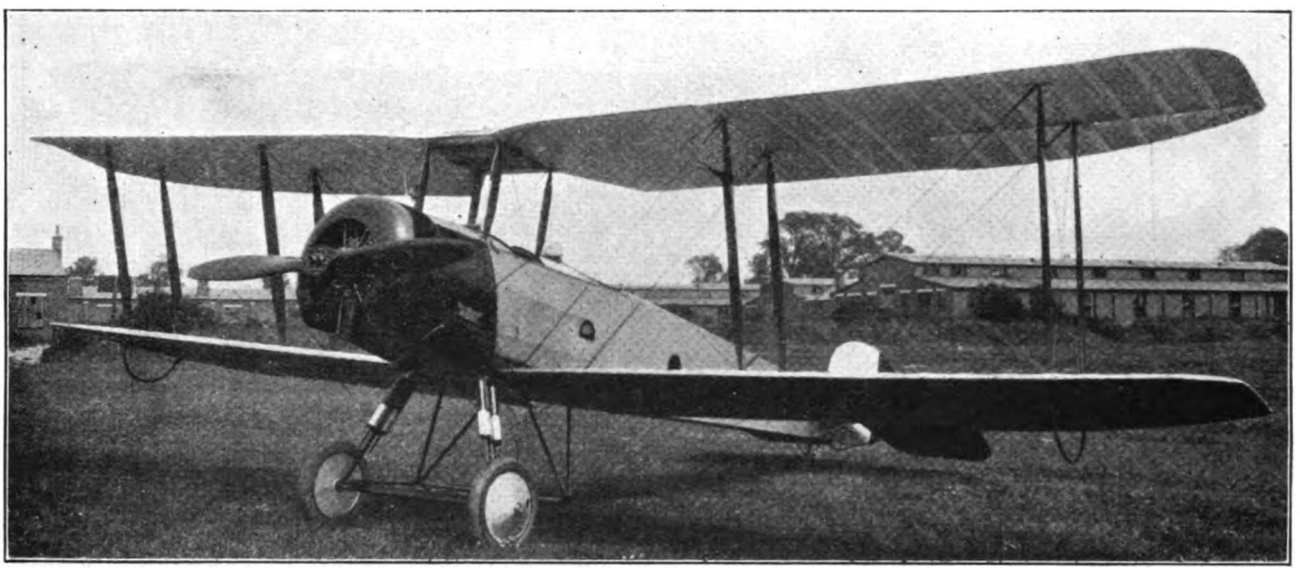
AVRO.



The Avro 504K (100 Mono-Gnôme engine) fitted with the new Avro oleo-pneumatic undercarriage.

A. V. Roe & Co., Ltd., 166, Piccadilly, London, W.1.
Works: Hamble, Hants, and Newton Heath, Manchester.

The history of the *Avro* machine begins with the design in 1906 by Mr. A. V. Roe of a biplane, which by leaving the ground at Brooklands, in July, 1908, was the first British aeroplane to fly. In 1909, Mr. Roe flew a triplane with a 9 h.p. J.A.P. engine at Lea Marshes. During 1910, Mr. Roe built two more triplanes, fitted with 30 h.p J.A.P. and 35 h.p. Green engines, and flew them at Wembley and at Brooklands.

Early in the summer of 1911 an *Avro* biplane made its first flights at Brooklands, piloted by Mr. Howard Pixton. At this period the embryo "Avro" firm was financed by Mr. H. V. Roe, who owned the firm of Everitt & Co., Webbing Manufacturers, of Manchester.

From this biplane of 1911 the development of the *Avro* machines is to be traced through a very pretty little machine with a 40 h.p. E.N.V. engine, built for Mr. Duigan, the first Australian aviator, an extremely efficient two-seater with a 60 h.p. E.N.V. engine, a series of 50 h.p. Gnôme-engined machines ordered by the War Office, which were actually the first aeroplanes designed and built by a British firm to be delivered to the British Army, to the totally enclosed biplane with the 60 h.p. Green engine, which gave so good an account of itself in the British military trials at Salisbury Plains in 1912.

Early in 1913 the famous two-seater *Avro* with an 80 h.p. Gnôme engine made its appearance. This machine—unaltered in all its essential aerodynamic features and in its main dimensions—survives to this day as the *Standard Avro* (Type 504 K.) training machine.

For peace purposes the machine, unaltered, has been found excellent for joy-riding purposes, and a float undercarriage has been fitted for work of that type on the coast. It has been fitted with various engines and maintains its popularity to a surprising extent.

Mr. H. V. Roe left the firm in 1917 and joined the Royal Flying Corps. He was injured in an accident in the Vosges while night-flying, and has now retired from the aircraft business.

THE AVRO 504N.

This machine is a further modification of the type 504 for training and similar purposes. The 504N is fitted with an Armstrong-Siddeley "Lynx" air-cooled radial engine of 160 h.p., in place of the rotary engine usually fitted for training purposes. Very great care has been taken in the installation of this engine and every possible precaution against fire is embodied.

The undercarriage which is fitted is of a new and practically unbreakable type which combines oil dashpot damping with rubber discs in compression.

The top centre section of the wings has been cut back to the spars on both leading and trailing edges, which greatly improves the view upward from both seats. The centre section gravity petrol tank of the earlier types is replaced by two tanks on the lower surface of the top plane, fitted just outside the centre section.

An adjustable tail-plane is fitted, controlled by levers from both cockpits, and, in order to lighten and harmonize the controls, ailerons of an improved shape have been fitted. It will be seen from the illustration reproduced that the chord of the ailerons has been greatly reduced toward the wing tip.

The 504 Type Avro with Renault engine (80 h.p.).

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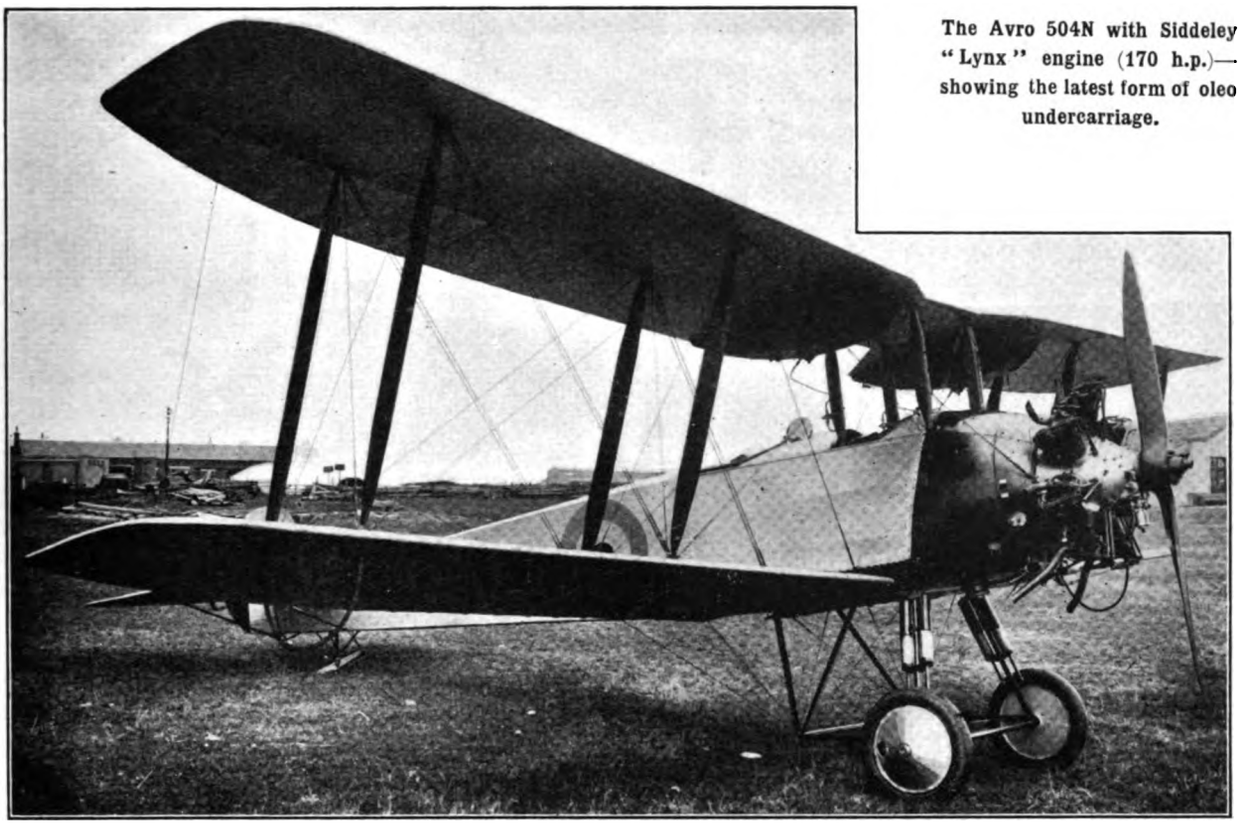
AVRO—*continued.*



The Avro 504N with Siddeley "Lynx" engine (170 h.p.)—showing the latest form of oleo undercarriage.

THE AVRO "ALDERSHOT."

During 1922, the Avro firm produced for the Air Ministry a large single-engine bomber known as the "Aldershot" fitted with the Rolls Royce Condor engine of 650 h.p.

This machine made its first public appearance at the R.A.F. Pageant at Hendon in the summer of that year, and created a very favourable impression of speed, manœuvrability and climb—an impression which it is understood has been confirmed by the official tests of the type.

As is always the case with new military aircraft for the British Air Ministry, no detailed information as to dimensions or performance is allowed to be published. The photographs reproduced on this and the following page will, however, give a good idea of the machine.

THE AVRO "ALDERSHOT-CUB."

A modified Avro "Aldershot" has also been built, fitted with the new Napier "Cub" engine of 1,000 h.p., and was thus the highest powered single-engine aeroplane in existence up to the middle of 1924.

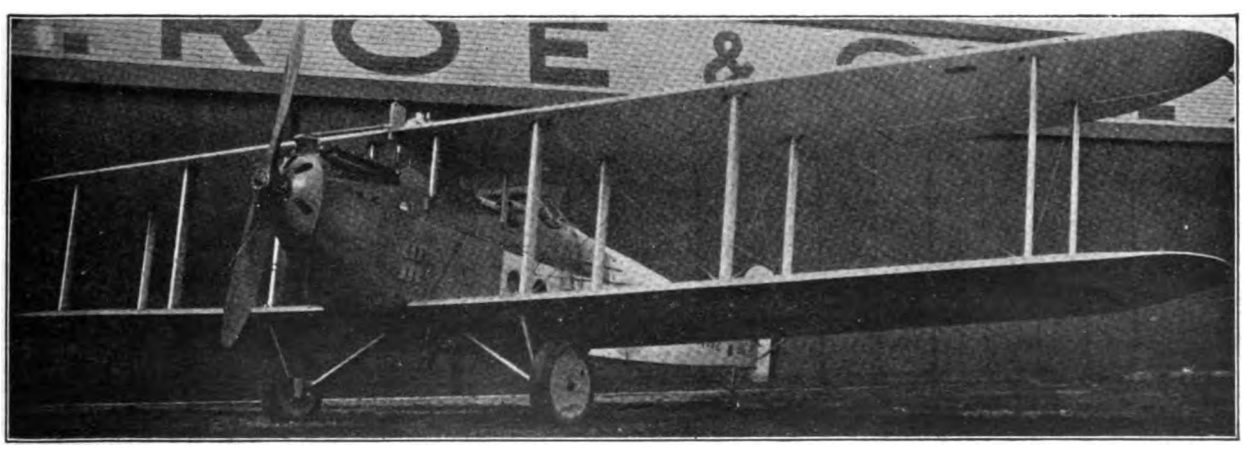
As in the case of the "Aldershot," no details of this machine may be published—but it is understood that both machine and engine have so far given great satisfaction.

Photographs of the machine will be found on the next page.

THE AVRO "BISON."

This is a machine equipped for fleet spotting, and fitted with a Napier "Lion" engine of 450 h.p.

Like the "Aldershot," it may not be described.



The Avro "Aldershot" Bomber (650 Rolls-Royce "Condor").

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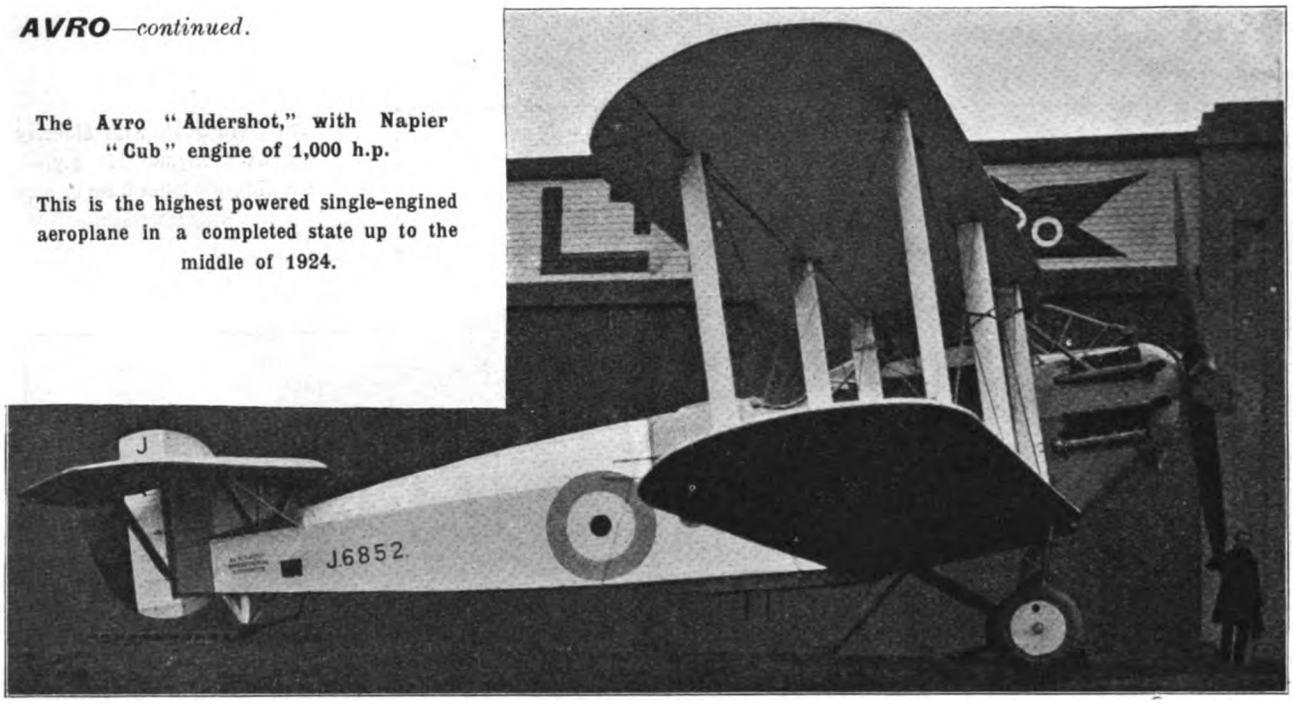
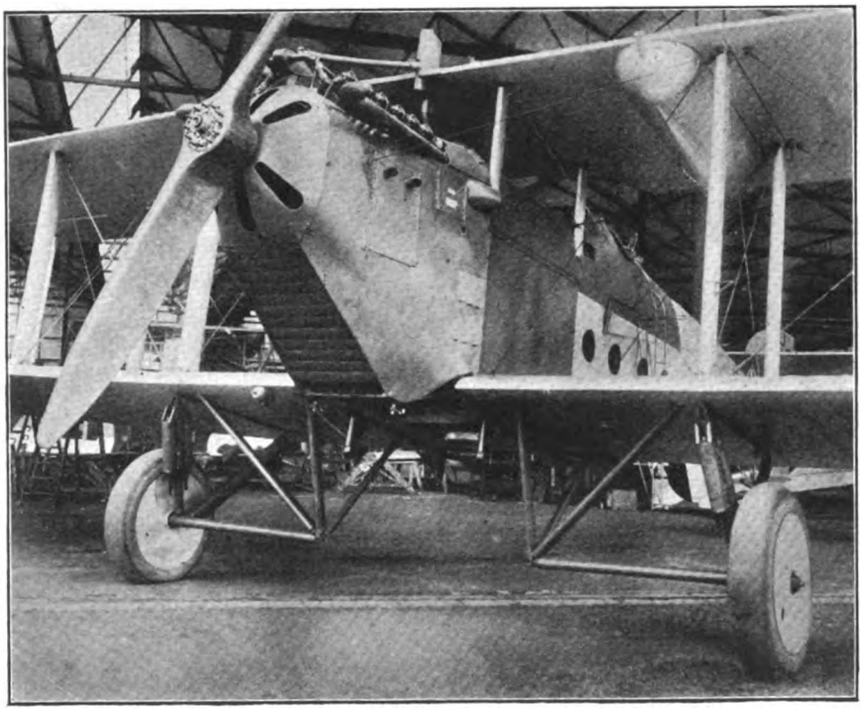
AVRO—*continued.*

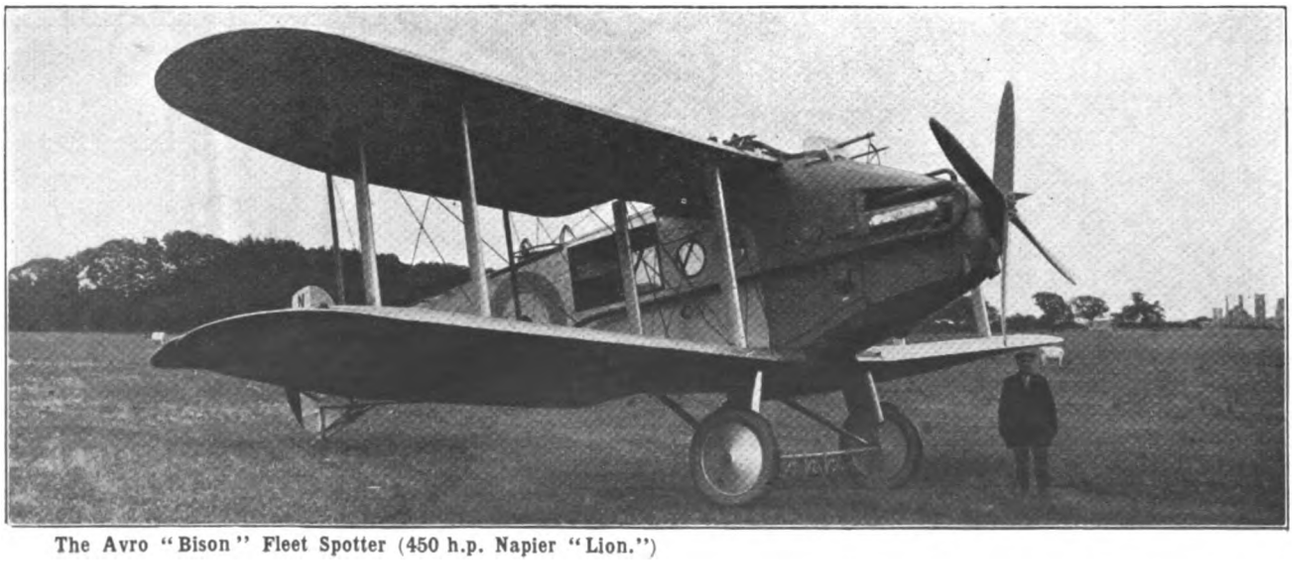


The Avro "Aldershot," with Napier "Cub" engine of 1,000 h.p.

This is the highest powered single-engined aeroplane in a completed state up to the middle of 1924.



This photograph shows a modified Avro "Aldershot" (650 h.p. Rolls-Royce "Condor") fitted with an improved form of oleo-pneumatic undercarriage and with outboard fuel tanks under the upper wings.



The Avro "Bison" Fleet Spotter (450 h.p. Napier "Lion.")

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AVRO—*continued*

The AVRO type 558 light aeroplane (500 c.c. Douglas engine.)

THE AVRO TYPE 558.

A single-seat light aeroplane which performed very well at the Lympne Competitions in 1923, where it reached 13,000 ft. in the altitude test.

The machine is a very heavily staggered biplane with a large gap/chord ratio, R.A.F.15 wings and a single interplane strut on each side of the fuselage. The undercarriage consists of an axle sprung inside the fuselage, carrying two wheels, half projecting through the floor.

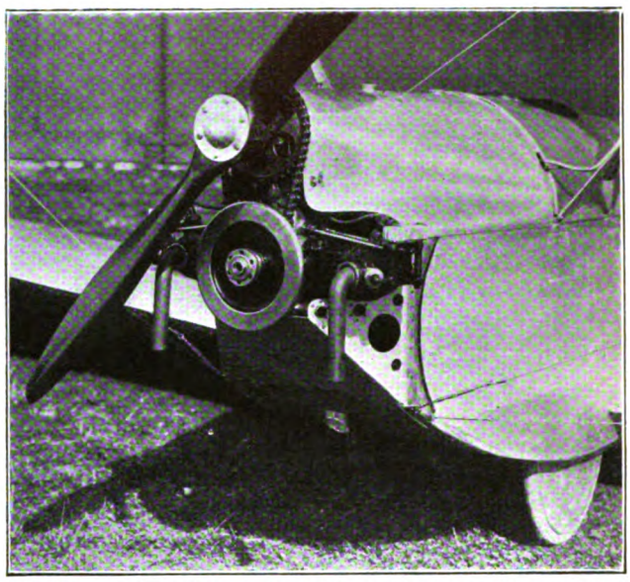
A 500 c.c. Douglas flat twin engine fitted with chain reduction gear formed the power plant.

THE AVRO TYPE 560.

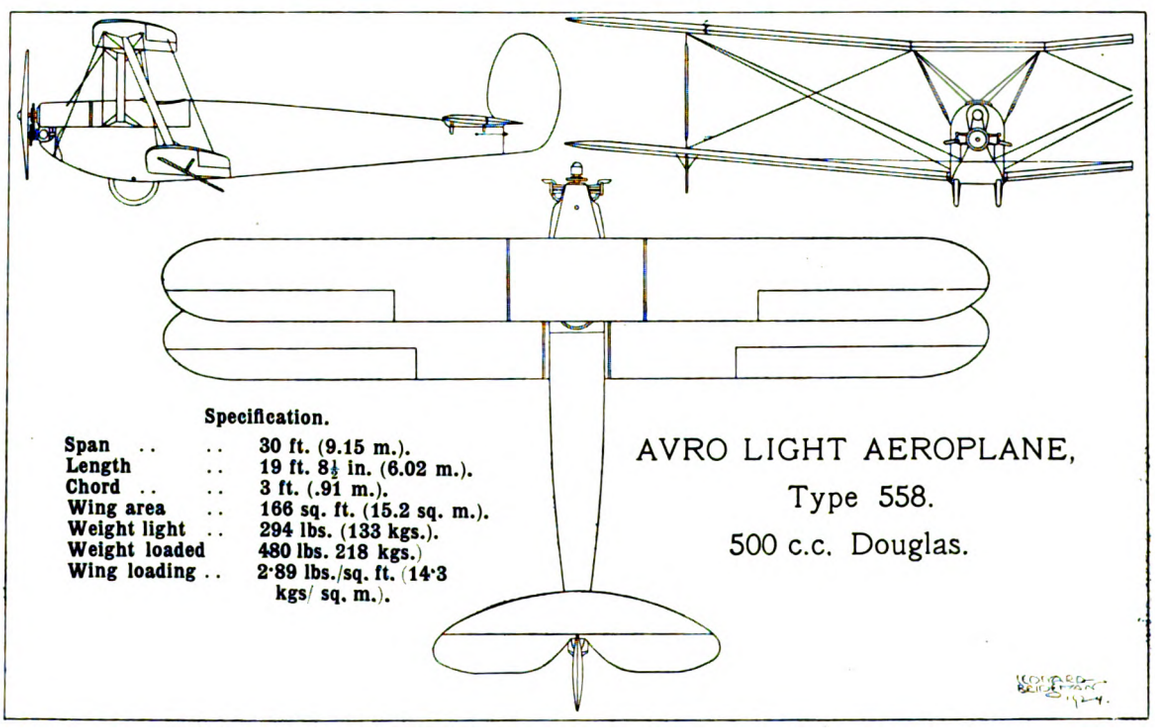
Another single-seat light aeroplane which distinguished itself at Lympne in 1923 by flying a total of 1,000 miles round the course. This machine is a cantilever monoplane with tapered wings of a biconvex section. The wings are attached at the top of the fuselage, with the pilot seated between the spars. An elementary undercarriage consisting of two short deep struts projects below the fuselage and carries a normal rubber sprung axle.

The engine—a Blackburne V twin of 698 c.c.—is bolted to a duralumin plate at the front end of the fuselage and drives the airscrew direct.

The machine can be fitted with an alternative pair of wings of reduced span, which lead to an increase in landing speed and a higher top speed.



The engine installation and chain drive of the AVRO 558.



Specification.

Span	**30 ft. (9.15 m.).**
Length ..	**19 ft. 8½ in. (6.02 m.).**
Chord	**3 ft. (.91 m.).**
Wing area ..	**166 sq. ft. (15.2 sq. m.).**
Weight light ..	**294 lbs. (133 kgs.).**
Weight loaded	**480 lbs. 218 kgs.)**
Wing loading ..	**2·89 lbs./sq. ft. (14·3 kgs/ sq. m.).**

AVRO LIGHT AEROPLANE,
Type 558.
500 c.c. Douglas.

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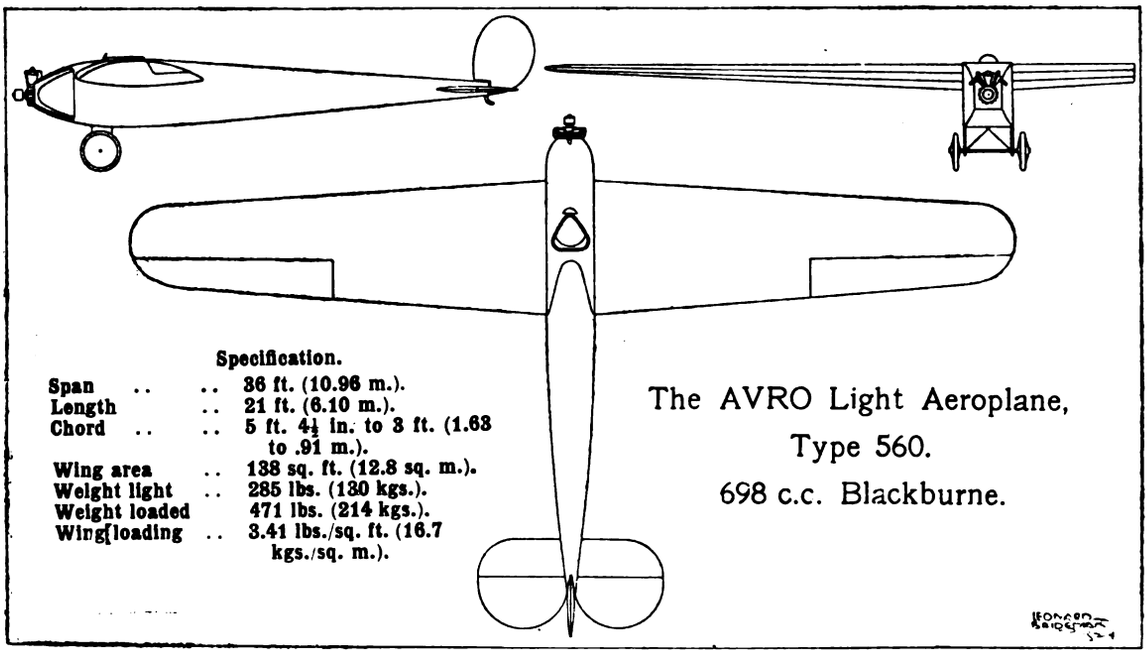
***AVRO**—continued.*

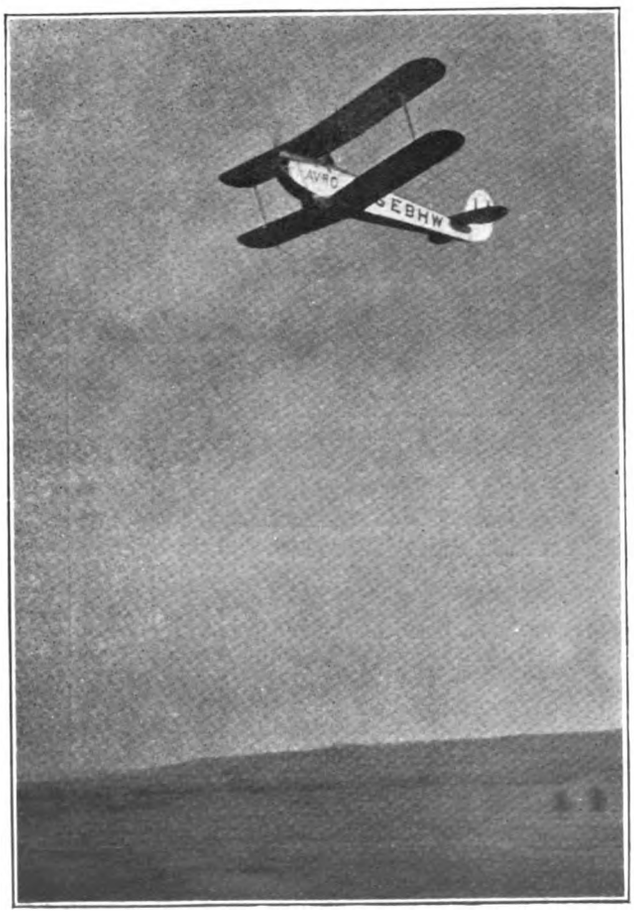


Specification.

Span	**36 ft. (10.96 m.).**
Length ..	**21 ft. (6.10 m.).**
Chord	**5 ft. 4½ in. to 3 ft. (1.63 to .91 m.).**
Wing area ..	**138 sq. ft. (12.8 sq. m.).**
Weight light ..	**285 lbs. (130 kgs.).**
Weight loaded	**471 lbs. (214 kgs.).**
Wing[loading ..	**3.41 lbs./sq. ft. (16.7 kgs./sq. m.).**

The AVRO Light Aeroplane,
Type 560.
698 c.c. Blackburne.

The fuselage, undercarriage and engine of the Avro monoplane type 560.



The Avro Biplane type 558 (500 c.c. Douglas engine), piloted by flying officer Hamersley starting for its climb to over 13,000 ft. during the British Light Aeroplane Competitions at Lympne in October, 1923.

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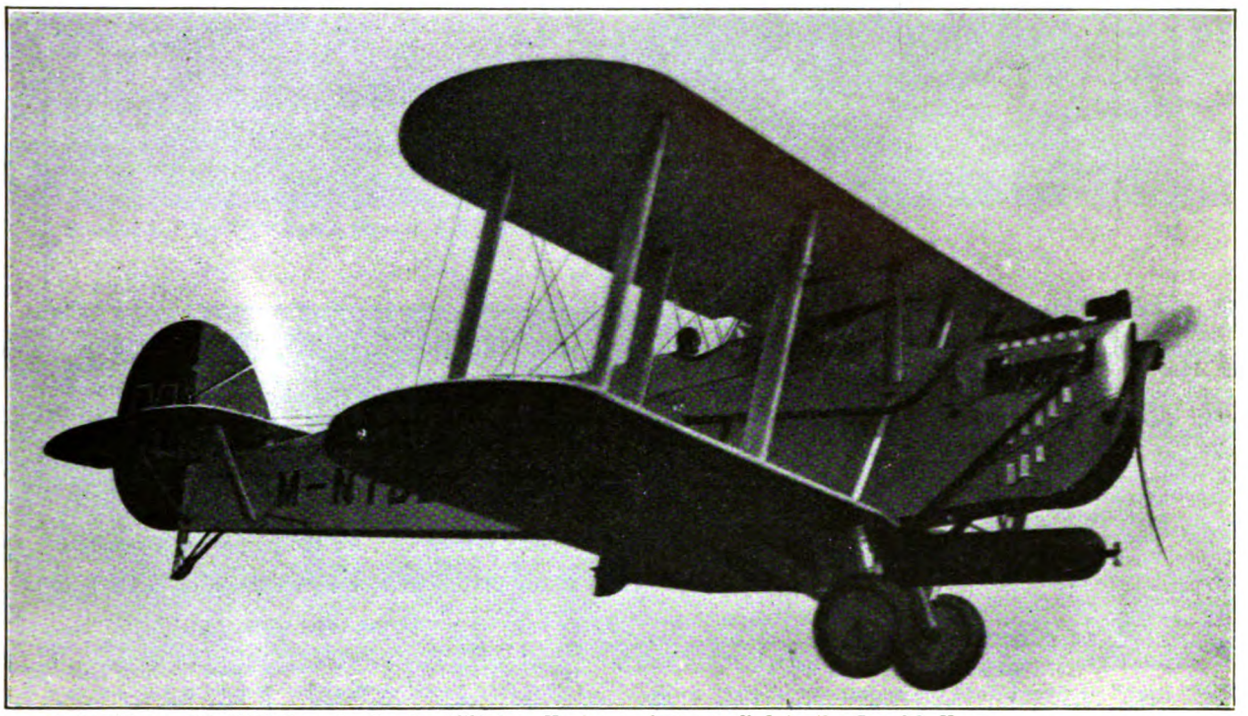
B

BEARDMORE. Wm. Beardmore & Co., Dalmuir, nr. Glasgow, Scotland. The world-famous firm of engineers and shipbuilders, proposed, just before the war, to construct under license the *D.F.W.* biplane (see GERMANY) fitted with Beardmore Daimler motors.

In addition to the manufacture of quantities of machines of external design, this firm during the war produced a number of machines of its own design. After the war the firm embarked on the design of a series of commercial aeroplanes, but during 1921 ceased active work in its aircraft department. This department was re-opened early in 1924, work being started on a two-seater light aeroplane for the Air Ministry Competition.

The firm has also arranged to build a large multiple-engined machine of all-metal construction for the Air Ministry.

BLACKBURN.



A Blackburn "Swift" Torpedo Carrier (450 h.p. Napier engine) supplied to the Spanish Navy.

The Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds, and Brough, Yorkshire. Founded by Mr. Robert Blackburn, who produced his first aeroplane in 1910 and has continued to manufacture aircraft ever since.

Mr. Bumpus (late Major R.A.F.) is the chief technical official of the firm.

Late in 1923 Major J. D. Rennie, who was largely responsible for the development of big flying-boats at Felixstowe during the War, 1914-18, joined the firm as float and hull designer for seaplane work.

The war products were described in the 1919 edition of this work.

The Blackburn firm during the war worked largely for the Admiralty, and in particular specialized in the production of torpedo-carrying aircraft. Their most modern types in this class, the "Swift" and the "Dart," represent the most advanced of machines of this class.

THE BLACKBURN "SWIFT."

Constructionally, the "Swift" is robust and elastic to meet the strain of sudden manœuvres. In the detail work, great care has been taken to guard against corrosion due to sea-air and salt-water. Another aim has been the minimisation of upkeep labour: the whole of the central unit, comprising the engine mounting, centre part of fuselage, undercarriage, and centre section of wings, is a steel framework which practically can never need trueing up.

As a ship aeroplane, the "Swift" is fitted with airbags for flotation in the event of forced alighting at sea, and with wheels automatically removable in the air, to render such landings safe. Slings for hoisting aboard ship are also fitted. To facilitate stowage on shipboard, the machine folds its planes, and the folding gear is of interest not only for its sound mechanical design, but also because in this case staggered wings are arranged to fold. This presents certain difficulties, and heretofore folding wings have entailed the loss of that appreciable improvement of the pilot's view and the slight increase in performance which staggered wings permit.

Below each of the front spar centre section struts is provided a telescopic oleo-pneumatic chassis strut, supported by a hinged strut running backwards from its base to the base of the rear spar struts, and on each side heavy tubes, fixed a little off the centre line of the bottom of the fuselage, run towards the telescopic strut and thence horizontal tubes form the wheel spindles.

There is thus a clear space below the fuselage for the dropping of the torpedo.

The wings are set onto the fuselage at a very coarse angle and with an appreciable stagger, and are attached to the centre section by hinges on rear spars and spigot and socket joints on the front spar, thus folding. Owing to the combined stagger and inward rake on the centre section struts the wings, folded, are inclined upward and the top wing retreats inward over the fuselage, the lower one remaining outside the lines of the body when seen in plan.

Examples of the "Swift" have been purchased by some of the leading foreign navies, among them those of the U.S., Japan and Spain.

Specification of the Blackburn "Swift."

Span	**48 ft. 6 in. (14 m. 75).**
Span folded	**17 ft. 6 in. (5 m. 40).**
Length	**35 ft. 6 in. (10 m. 82).**
Height	**12 ft. 3 in. (3 m. 74).**
Weight loaded	**6,300 lbs. (2,860 kgs.).**
Total load	**2,750 lbs. (1,250 kgs.).**
Maximum speed	**106 m.p.h. (171 km.h.).**
Maximum speed (engine on)	**45 m.p.h. (72.5 km.h.).**
Minimum speed (gliding)	**49 m.p.h. (79 km.h.).**
Climb at sea level	**750 ft./m. (228 m./min.).**
Ceiling	**15,000 ft. (4,600 m.).**

Owing to Air Ministry prohibitions, it is impossible to obtain details of certain of the firm's activities, but information from abroad is worth publishing :—

THE "SWIFT" SEAPLANE.

The Italian *Notiziarrio di Aeronautica*, of September, 1923, published drawings of a "Swift" torpedo-carrier fitted with twin floats. The machine is, except for floats, identical with the normal "Swift" described above. There is some reduction in useful load to compensate for the added weight of floats and the performance was estimated to be adversely effected. No example of this type has, however, been constructed.

THE "SWIFT" MARK II.

Another "Swift" variant, described in *Notiziarrio di Aeronautica*, has an increased span of 52 ft. (15.85 m.) and carries an increased quantity of fuel, a heavier torpedo or bomb load. The total loaded weight is 7,084 lbs. (3,220 kgs.). The top speed falls to 103 m.p.h. (166 km.h.) and the ceiling to 12,000 ft. (3,660 m.).

THE "SWIFT" MARK IV.

According to the Italian authority previously quoted, a modified "Swift," fitted to carry either bombs or a torpedo, plus a pilot and gunner, or alternately to act as a three-seater

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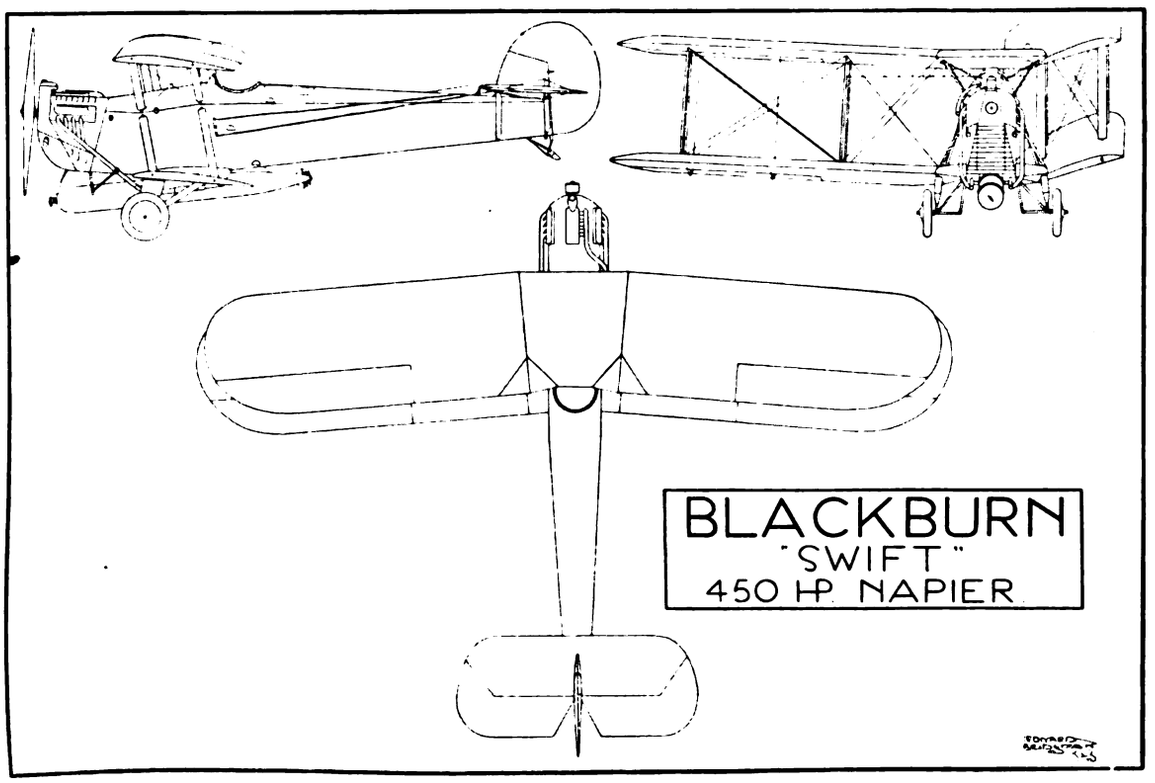
BLACKBURN—*continued.*



fleet spotter, has been designed. This machine is shown in a scale drawing, from which it will be seen that the machine is in appearance rather like the Blackburn fleet spotter type, as regards the nose of the fuselage, and like this machine carries the pilot above the engine and ahead of the top leading edge. Behind the wings there is an observer's cabin, and still further aft a gunner's cockpit. The undercarriage is of the divided type, suitable for torpedo carrying.

The general dimensions are the same as those of the normal "Swift." As a two-seater torpedo carrier, the machine weighs 6,600 lbs. (3,000 kgs.) fully loaded and has practically the same performance as is given above for the standard "Swift." As a three-seater spotter, the loaded weight falls to 5,350 lbs. (2,430 kgs.), the top speed rises to 112 m.p.h. (180 km.h.) and the ceiling to 18,200 ft. (5,550 m.).

THE BLACKBURN "DART."

The "Dart," produced since the appearance of the "Swift," is an improved version of the earlier machine.

Constructed to the order of the British Air Ministry, it is understood that this machine has given very satisfactory results. It is, however, not permitted to publish any details of this machine.

The photographs which are given herewith, however, suffice to show that the "Dart" very greatly resembles the original "Swift" in general design.

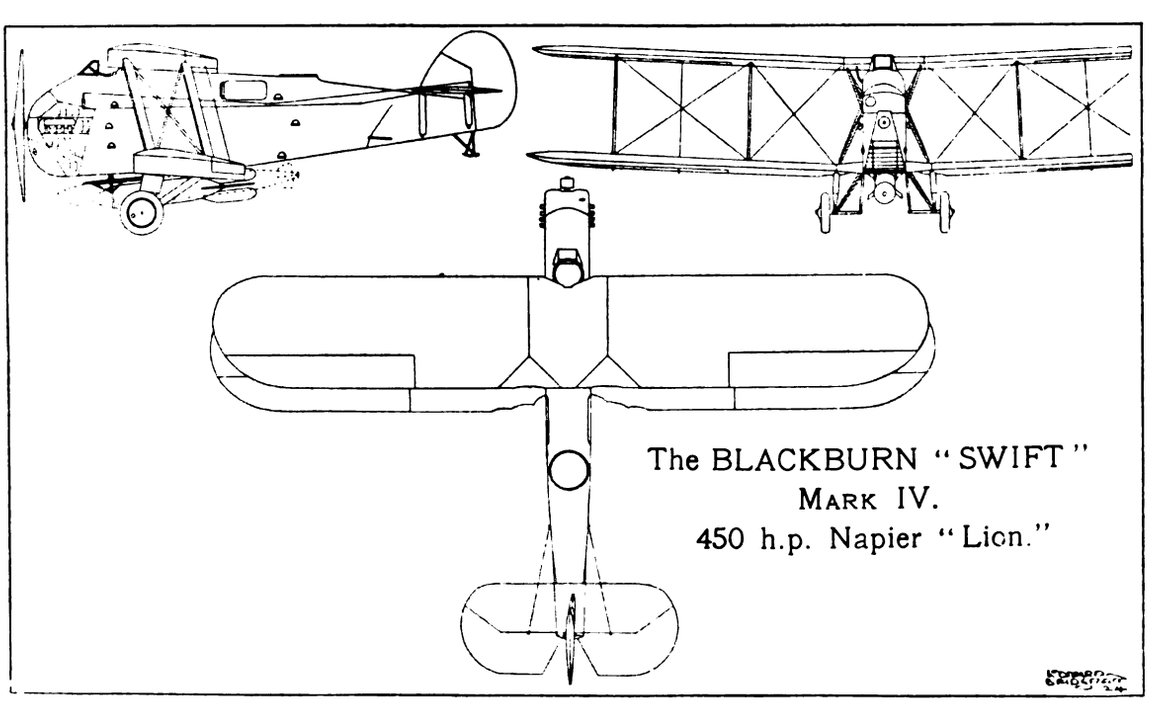
THE BLACKBURN "BLACKBURN" FLEET SPOTTER.

This machine, which is shown in two photographs, is like the "Dart" built to the order of the Air Ministry, and may not be described. It is designed for operation from the deck of an aeroplane carrier ship, for the purpose of reconnaissance and fire control.

It is quite obviously a near relation of the torpedo carriers described above.

THE BLACKBURN "CUBAROO."

The firm are now engaged upon the production of a very large torpedo-carrier known as the "Cubaroo," which is being fitted with the Napier "Cub" engine of 1000 h.p. Technical details of this machine may not be published, but the outline drawing of a machine of similar design submitted to the Italian Navy is probably closely allied to the "Cubaroo."



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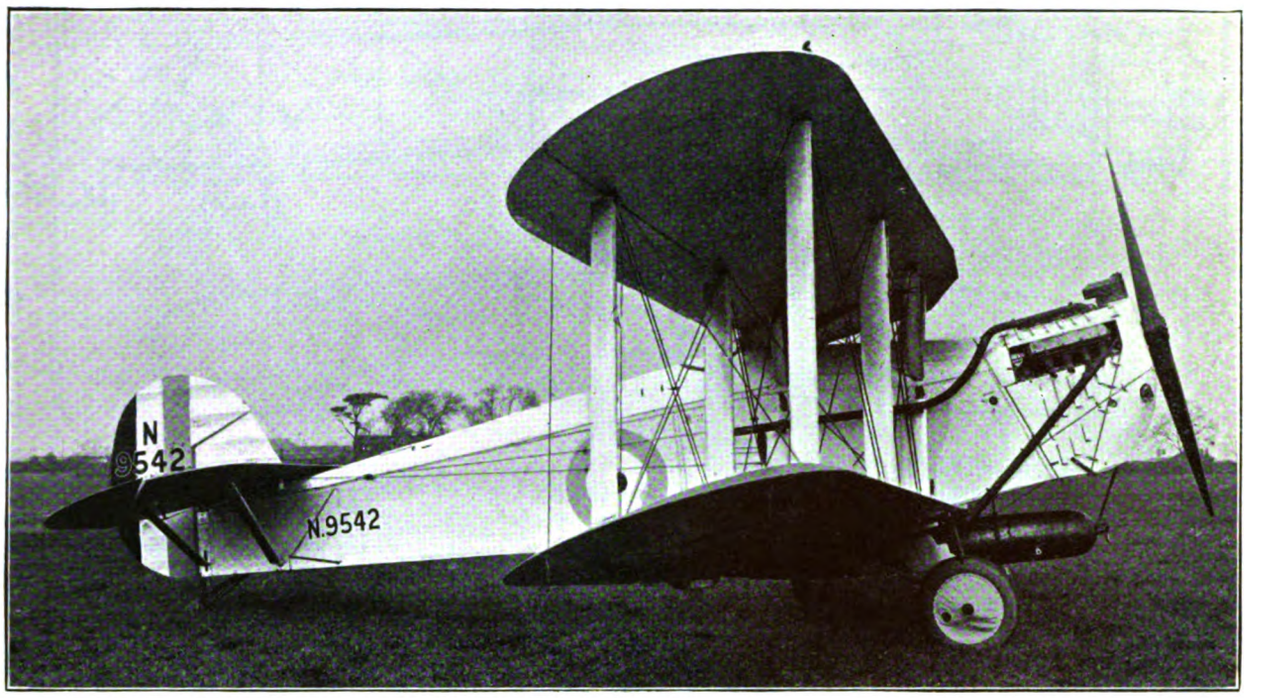
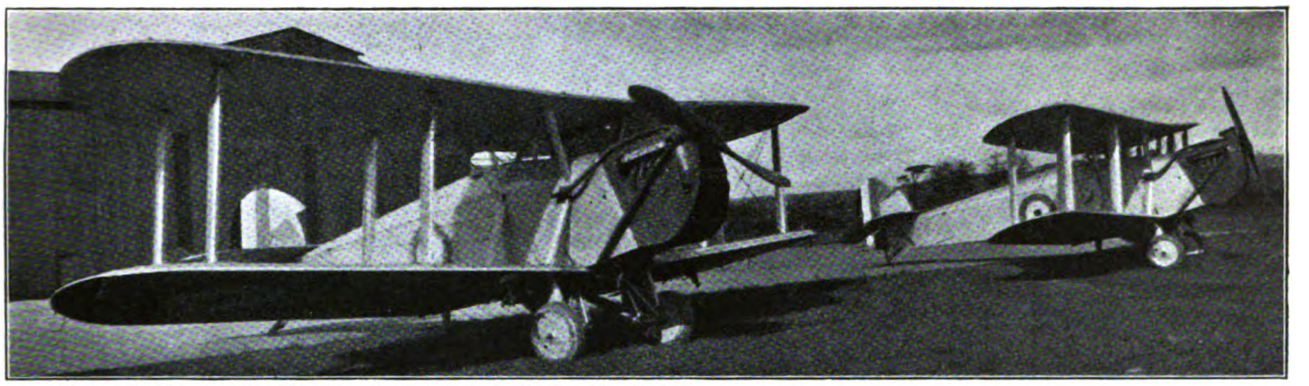
BLACKBURN—*continued.*



A Blackburn "Dart" Torpedo Carrier (450 h.p. Napier "Lion").



Two Blackburn "Dart" Torpedo Carriers, built for the R.A.F.

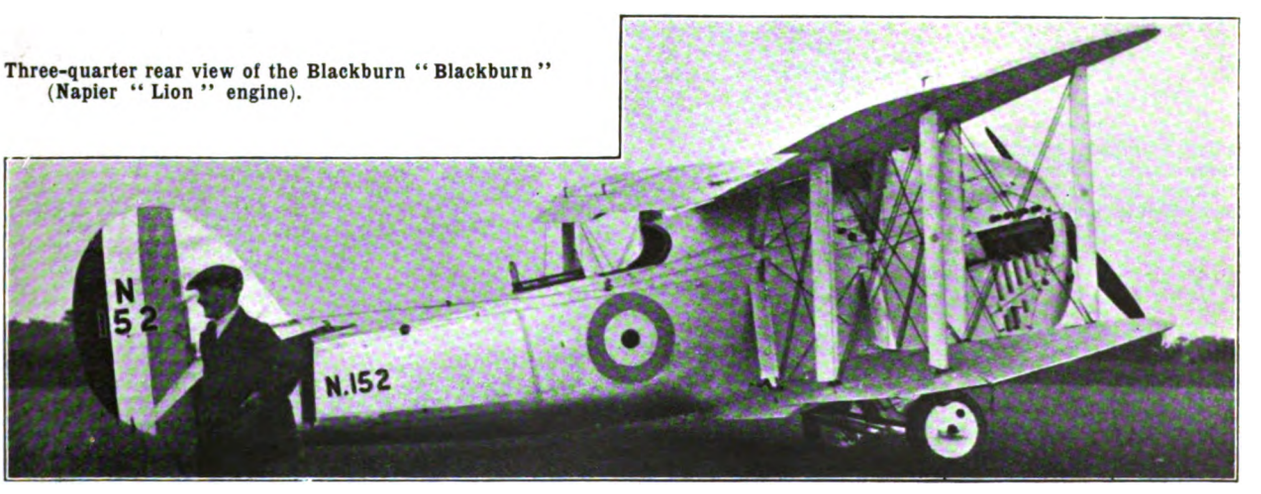
THE BLACKBURN TEN-SEATER.

Also, according to *Notizarrio di Aeronautica*, the Blackburn firm have designed a ten-passenger machine, which bears a very close resemblance to the "Swift." The pilot is carried above the engine and in front of the wing. Behind is a large ten-seated cabin. The machine is shown in a scale drawing.

THE "DART" MARK II.

Again, according to the *Notizarrio di Aeronautica*, a two-seater "Dart." This machine appears to be identical in general arrangement with the "Swift" Mark IV, except that it has only two seats, that for the pilot and an after-gunner's cockpit.

Three-quarter rear view of the Blackburn "Blackburn" (Napier "Lion" engine).



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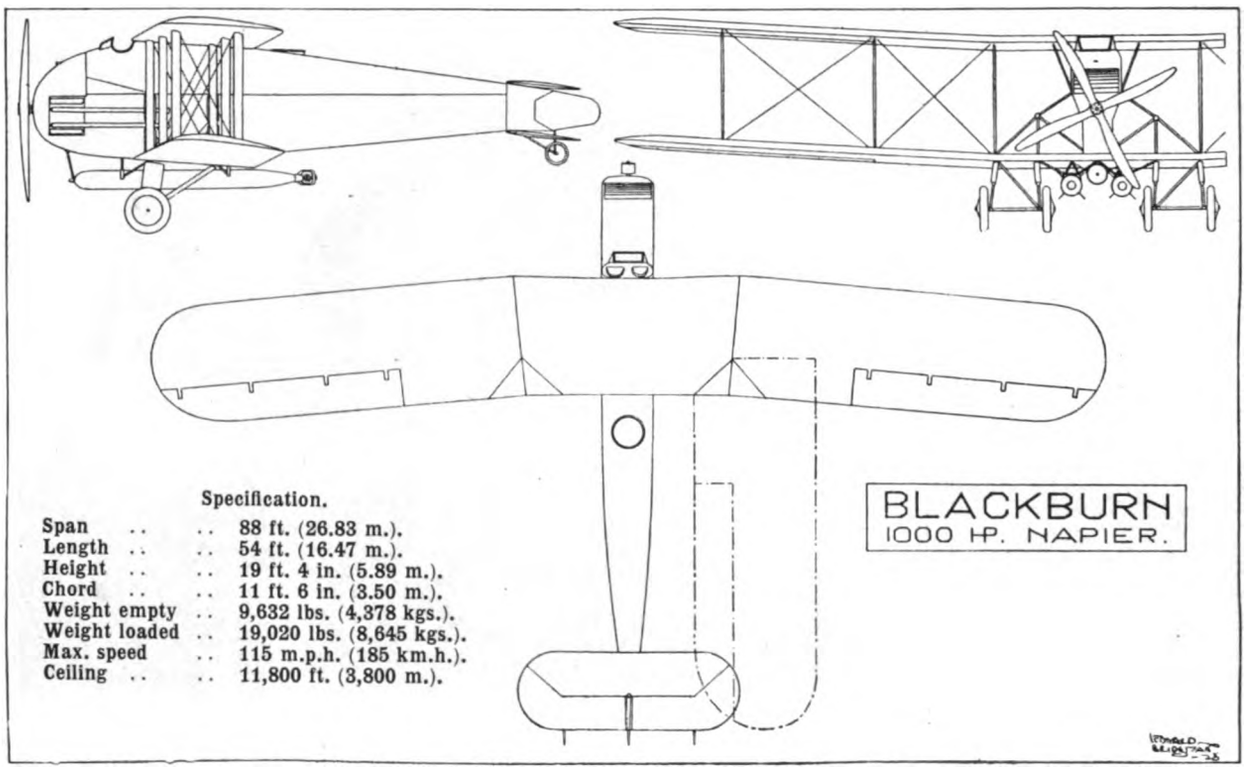
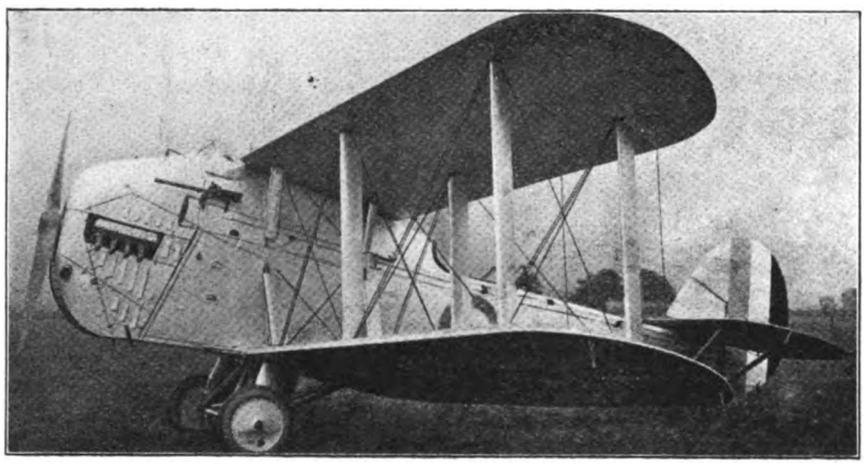
***BLACKBURN**—continued.*

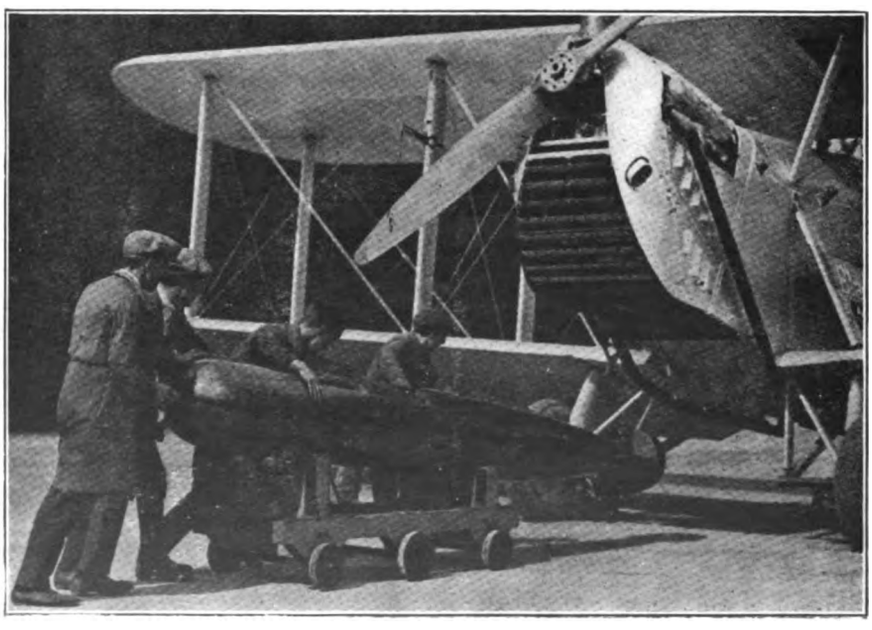


Specification.

Span	.. ..	88 ft. (26.83 m.).
Length	.. ..	54 ft. (16.47 m.).
Height	.. ..	19 ft. 4 in. (5.89 m.).
Chord	.. ..	11 ft. 6 in. (3.50 m.).
Weight empty	..	9,632 lbs. (4,378 kgs.).
Weight loaded	..	19,020 lbs. (8,645 kgs.).
Max. speed	..	115 m.p.h. (185 km.h.).
Ceiling	.. ..	11,800 ft. (3,800 m.).



The Blackburn "Blackburn" Fleet Spotter (450 h.p. Napier "Lion.").



Loading a torpedo onto a Blackburn Torpedo Carrier. The machine in the photograph is a "Swift" (450 h.p. Napier engine) built for the Spanish Navy.

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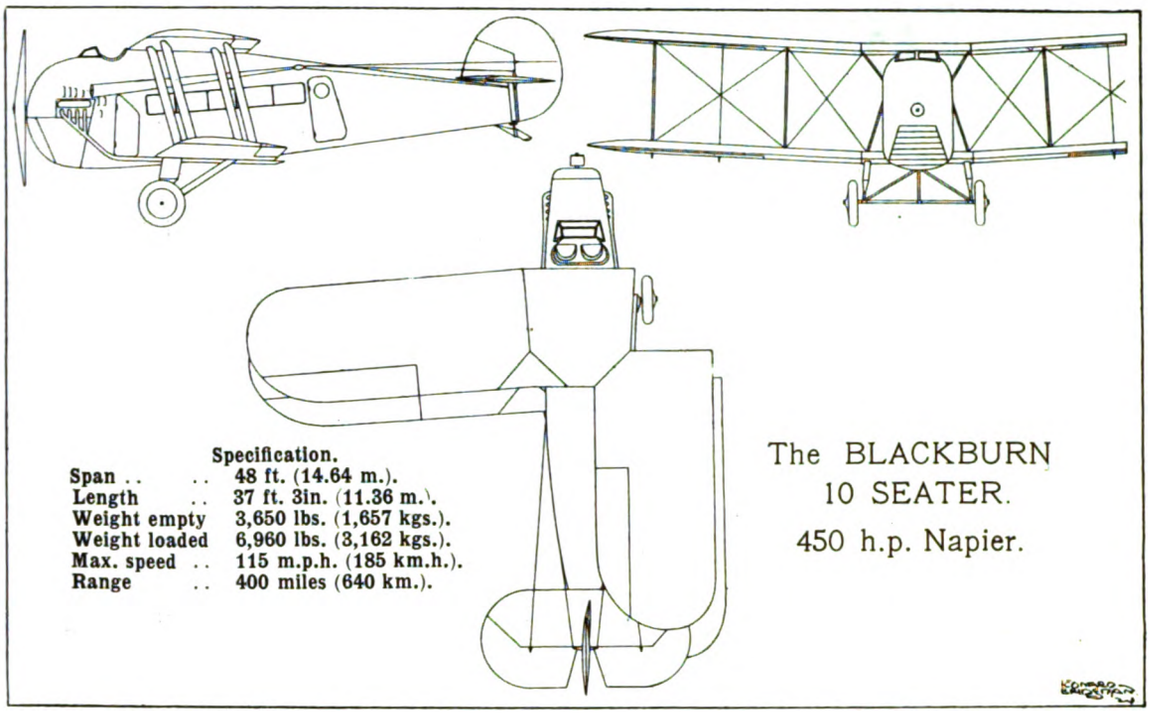
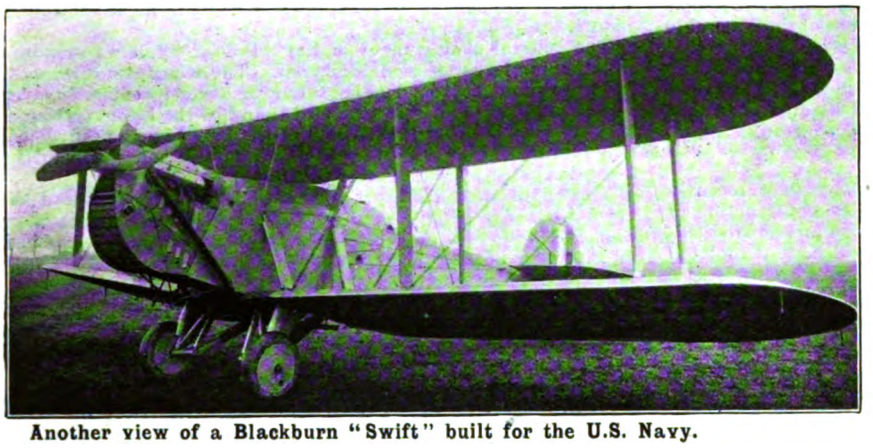
BLACKBURN—*continued.*


Specification.
Span .. .. 48 ft. (14.64 m.).
Length .. 37 ft. 3in. (11.36 m.).
Weight empty 3,650 lbs. (1,657 kgs.).
Weight loaded 6,960 lbs. (3,162 kgs.).
Max. speed .. 115 m.p.h. (185 km.h.).
Range .. 400 miles (640 km.).
The BLACKBURN
10 SEATER.
450 h.p. Napier.

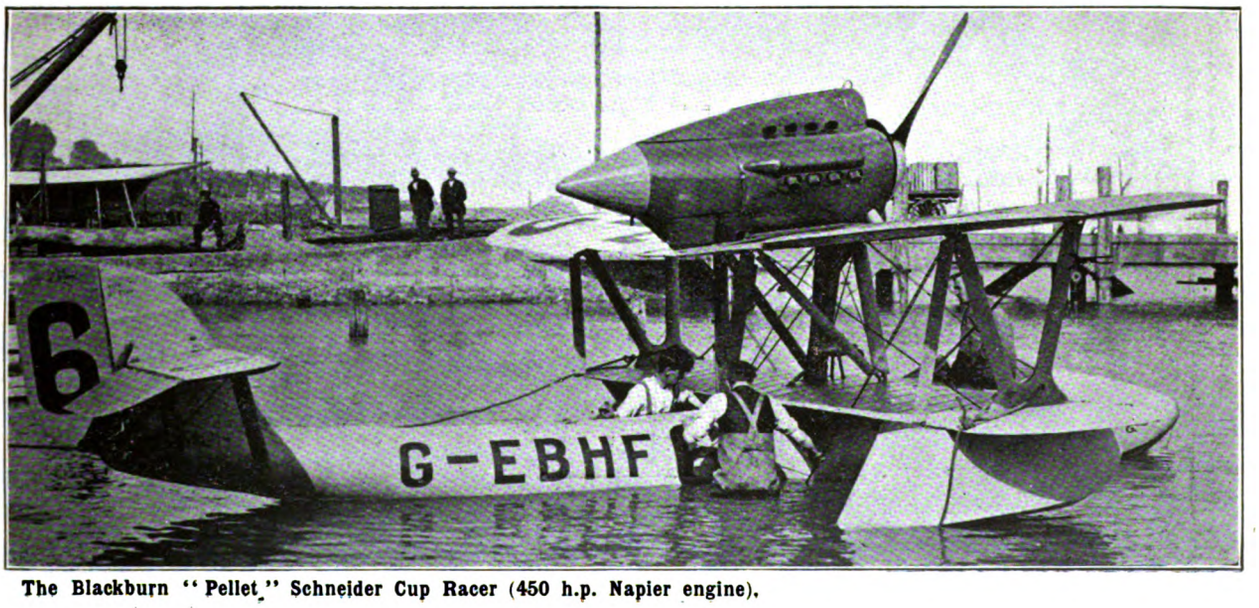


Another view of a Blackburn "Swift" built for the U.S. Navy.

THE BLACKBURN "PELLET."

The firm built for the 1923 Schneider Cup Race the distinctly unusual-looking flying-boat shown in a photograph below. This machine was fitted with a 450 h.p. Napier "Lion" engine.

Owing to stress of time, the machine was never properly tested before the actual race, and was the victim of a regrettable accident in an attempt to pass the "Navigability" tests, which resulted in the complete wreck of the machine.



The Blackburn "Pellet" Schneider Cup Racer (450 h.p. Napier engine).

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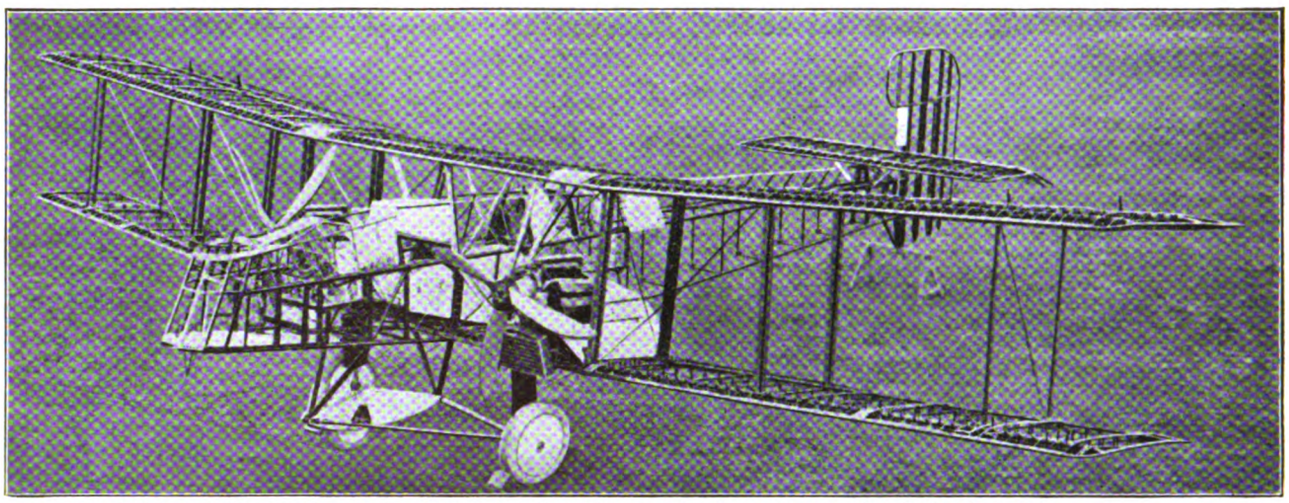
BOULTON & PAUL.



The skeleton of the Boulton & Paul "Bolton," a high-speed twin-engine bomber built of steel.

Boulton & Paul, Ltd., Norwich.

Big firm of building constructors. Hence have undertaken with conspicuous success the construction of aircraft to War Office specification.

Mr. J. D. North, one of the best-known of British aeronautical engineers, is the firm's chief technician and designer. Under his supervision much progress has been made in experiments with metal construction.

This work has involved a great expenditure on plant, tools and experiment, for it calls for the solution of innumerable problems covering a very wide range of technique and of practice, and Boulton & Paul have faced this expenditure only because they had a clear vision of, and confidence in, the advantages which could ultimately be gained by such methods. It is safe to say that they have now achieved results which justify their faith.

A very important line of experiment undertaken recently bears on the adaptation of rustless steel to the construction of all-metal aircraft. Great progress has been made in this direction, and before long Boulton & Paul will have completed a machine built of this material.

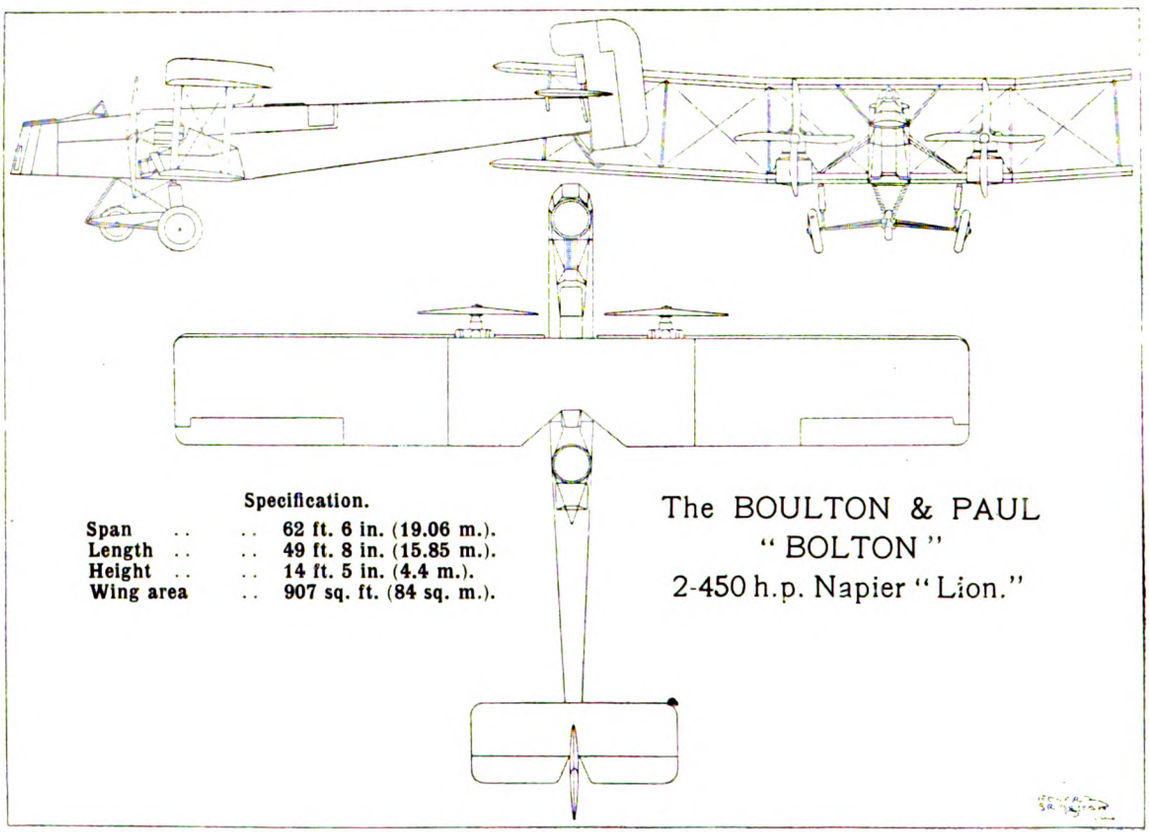
THE "BOLTON."

The "Bolton" may be regarded as an all-steel version of the original B. & P. twin-engined Bourges (see the 1919 edition). It is an all-steel high-speed bomber with twin Napier engines.

The whole structure of this machine is carried out in steel stripwork, shown in the illustration of the skeleton machine. One interesting detail special to the "Bolton"—the hand-starter-gear for the engines—whereby the engines can be started up from the rear of the lower wing without any climbing up of the wings themselves, deserves imitation. A further matter of some importance is the easy accessibility to the engine units, which is combined with very efficient cowling in of the power plants.

The general arrangement of the "Bolton" follows standard practice for large twin-engine types. The wings are of biplane form, top and bottom leading edges in a vertical line, but the upper wing having a greater chord than has the lower. Despite the difference in chord, the spars of the two wings are arranged at equal spacings from the leading edges and consequently the interplane struts are all vertical.

The engine nacelles are built upon the lower wing, and are carried between diagonal struts from the top rail of the fuselage and the first row of interplane struts. The tail plane and elevators are of monoplane type, a single fin and rudder—of very large area—is fitted.



Specification.

Span	.. ..	**62 ft. 6 in. (19.06 m.).**
Length	.. ..	**49 ft. 8 in. (15.85 m.).**
Height	.. ..	**14 ft. 5 in. (4.4 m.).**
Wing area	..	**907 sq. ft. (84 sq. m.).**

The BOULTON & PAUL
"BOLTON"
2-450 h.p. Napier "Lion."

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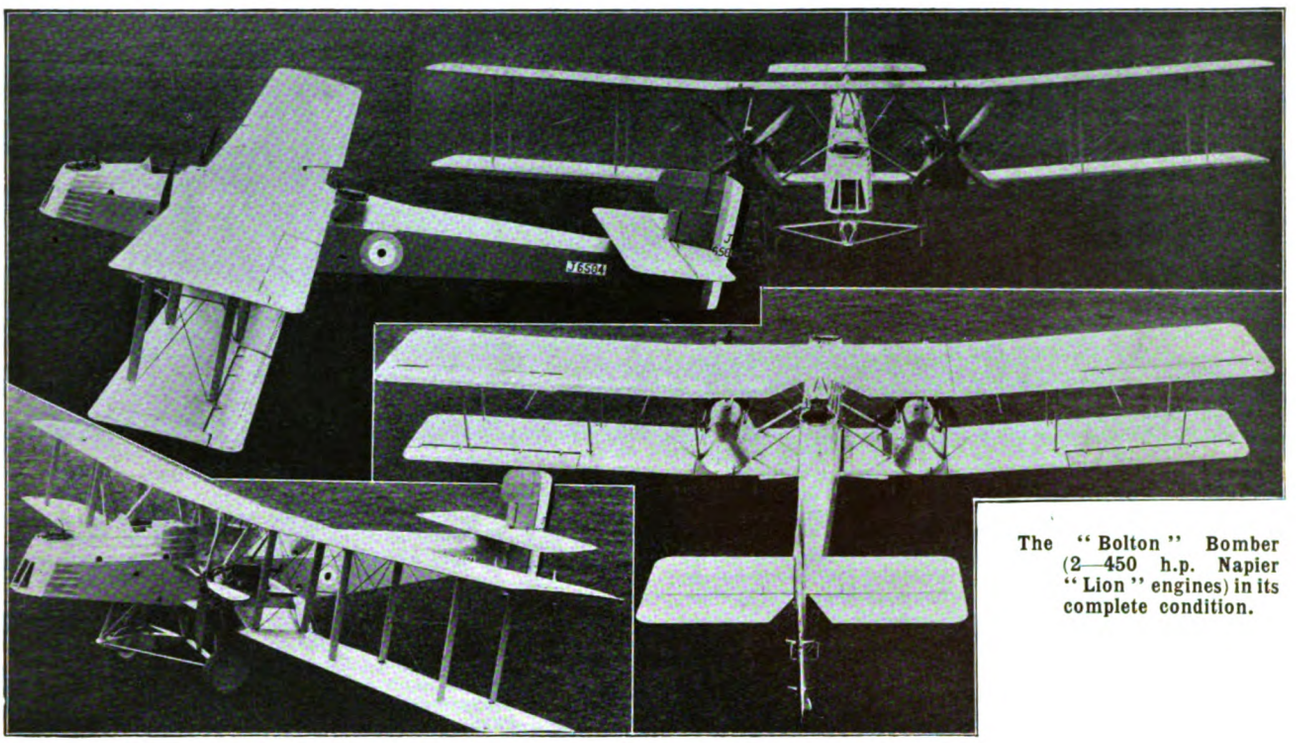
BOULTON & PAUL—*continued.*

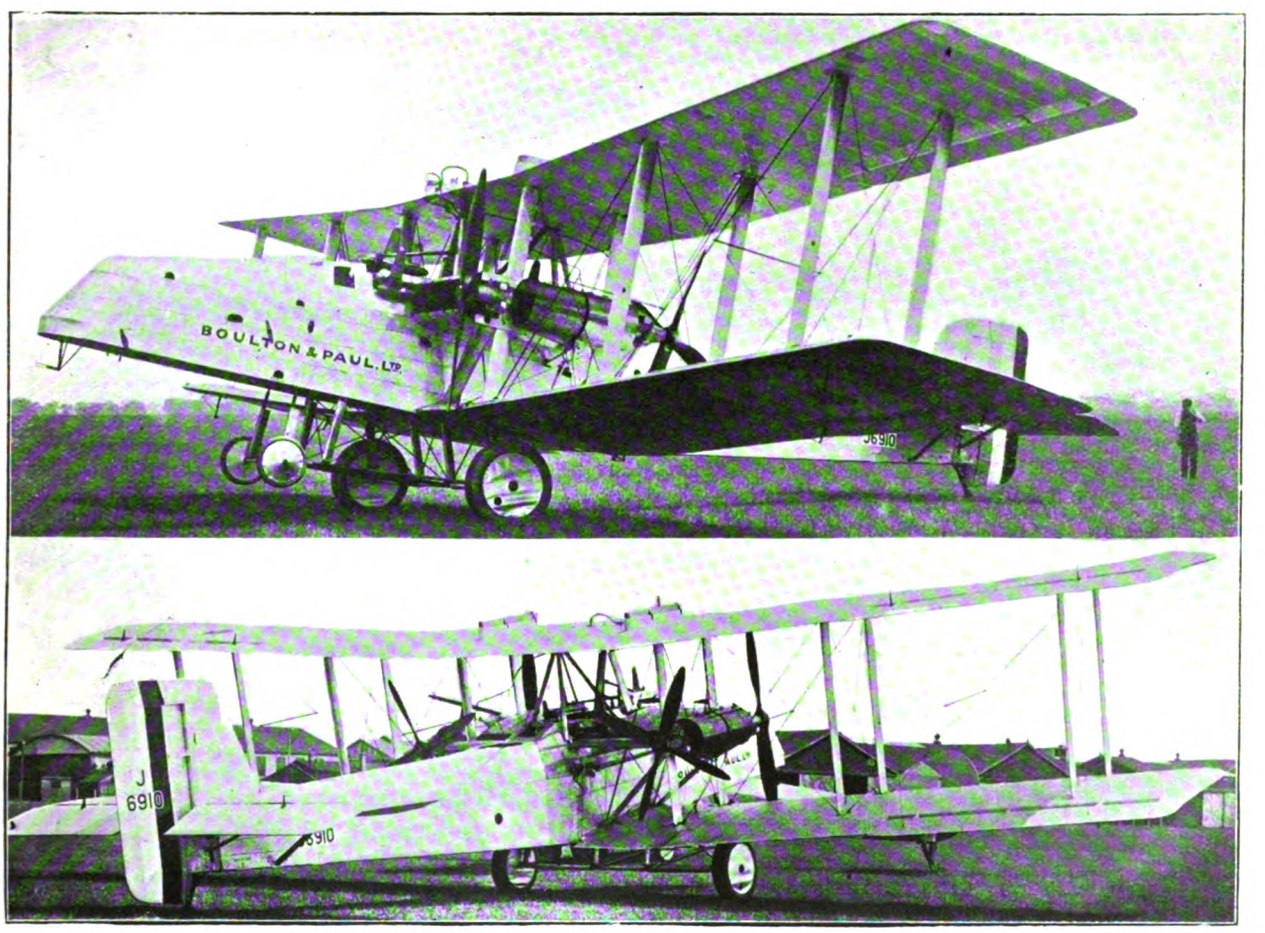


The "Bolton" Bomber (2—450 h.p. Napier "Lion" engines) in its complete condition.

Ailerons and rudder are balanced by the inset hinge method. The undercarriage is of the three-wheeled type, the two main wheels being carried on oelo-pneumatic legs from the lower front spar and on axles hinged to a pylon below the body. The front wheel is rubber sprung from a girder which passes from this latter pylon to another similar one further forward.

THE "BODMIN."

The "Bodmin" is officially described as a machine of Postal type, and is really an experiment—to Air Ministry specifications—in the central engine-room and gear-drive type of aeroplane.



The Boulton & Paul "Bodmin" (2 Napier engines, 450 h.p. each). Four airscrews are gear-driven from the two engines.

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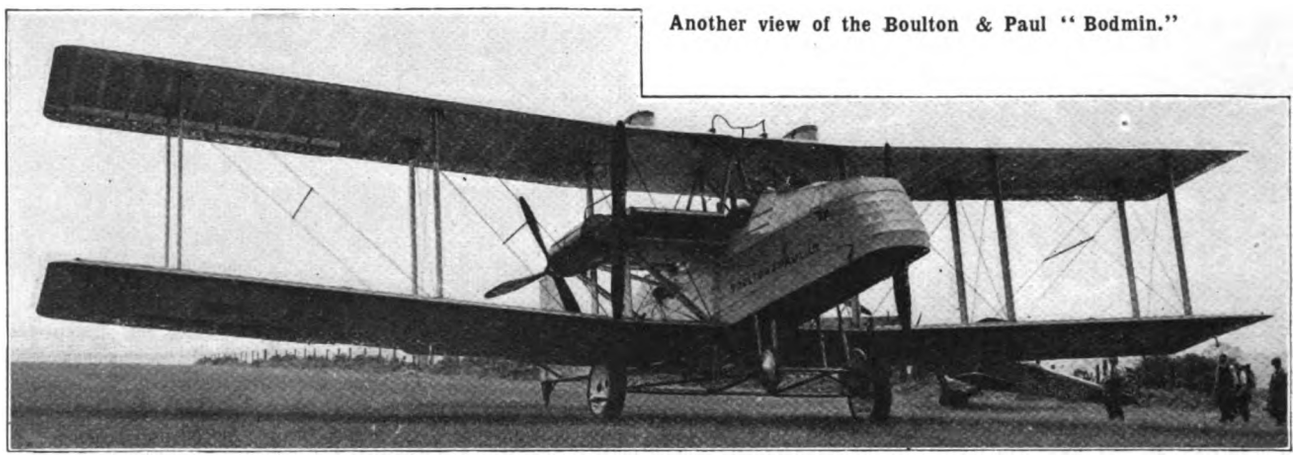
BOULTON & PAUL—*continued.*



Another view of the Boulton & Paul "Bodmin."

The machine has two Napier "Lion" engines installed one behind the other in the fuselage. Each of these engines drives a cross-shaft and each end of each cross-shaft in turn drives an airscrew shaft.

There are thus two tandem pairs of airscrews out-board between the wings—but both front airscrews are driven by the front engine and both rear screws by the rear engine. The idea underlying this arrangement is that in addition to the added security from engine failure given by the presence of two engines, the failure of either front or rear engine does not set up a turning movement as in the ordinary twin-engine type, and therefore no rudder drag has to be set up to fly a straight course.

In addition, the possibility of repairing minor breakdowns in the air is given by the central engine arrangement.

"The Bodmin" is a large and relatively lightly loaded machine of normal biplane form steel built throughout. As already mentioned, two Napier engines are carried in the fuselage with between them a mechanic's seat and a complete equipment for the starting and control of the two engines and their accessories. The pilot is provided with throttle and switch controls only—all matters pertaining to fuel oil and water supply and temperature being removed to the engine-room.

Each engine has built onto it a gear box for the cross-shaft drive, and the cross-shafts themselves are carried in large diameter steel casing tubes bolted up to flanges on the engine gear box at one end and the airscrew shaft and gear boxes at the other. Fore and aft airscrew boxes on each side are tied together by tubular members, and are supported from the bottom of the fuselage by inclined steel struts.

The engine section of the fuselage and the whole gear and airscrew mounting thus form a rigid triangulated structure—quite independent of the wing structure.

Cylindrical fuel tanks are built round the fore and aft ties between airscrew gear boxes.

Radiators (in three units per side) are supported from the front cross-shaft casing and the radiators are joined by a pair of surfaces rather like wings in section, one inverted below and the other the right way up on top. Externally this forms a streamline section, internally it leaves an air passage which contracts in section very considerably at the tail. Inside this space oil coolers are fitted.

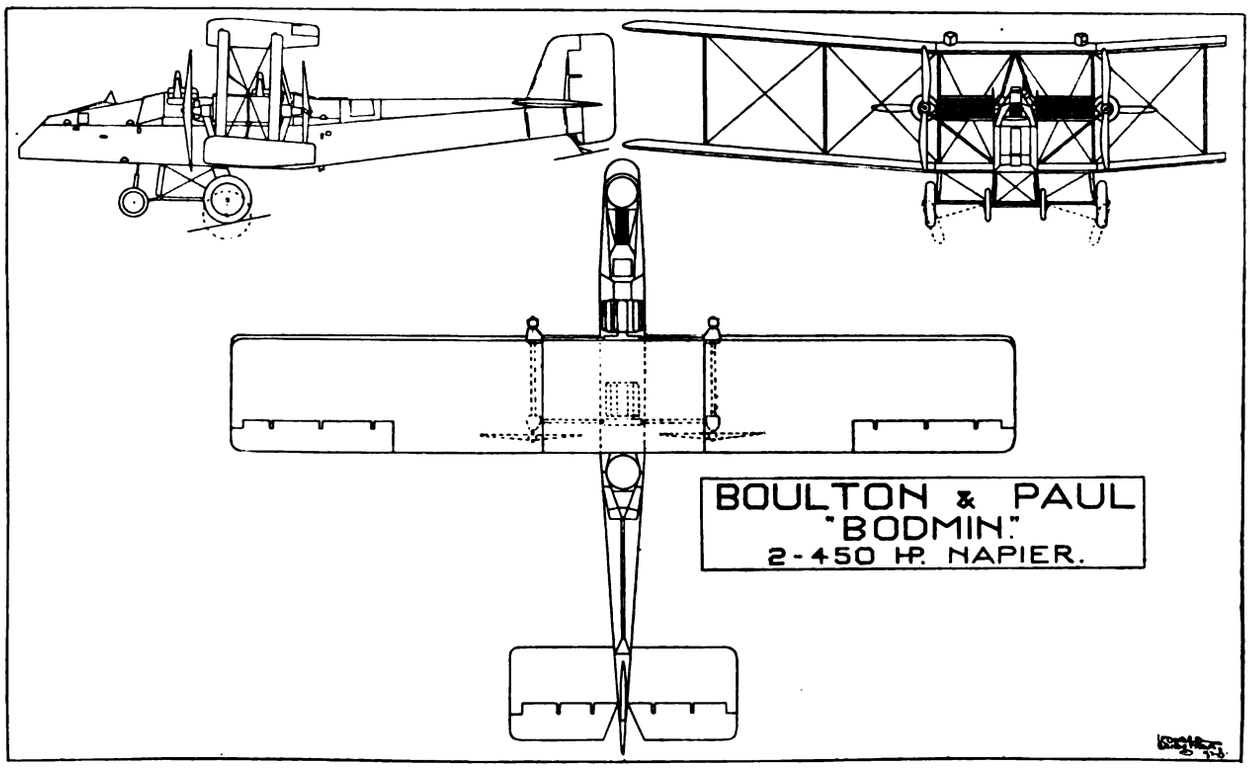
The three radiator units (which are sufficient for cooling in tropical climates) on each side are under control, not only in the matter of shutters but also to the extent that any one of them may be cut out from the engine room. Thus a leaking unit may be isolated without descending.

A feature common to all the recent B. & P. machines is the oleo-pneumatic undercarriage leg.

No springs are used in the leg at all—the machine is supported when at rest on air pumped into the top end of the cylinder by an ordinary tyre pump. The standard pressure—at rest—is 60 lbs. per sq. in., and experience shows that the pressure remains sensibly constant for months together. This air pressure serves—with the tyres—to cushion against taxying shocks, and to extend the leg to the landing position as soon as the machine leaves the ground.

THE "BUGLE."

This is a twin-engine high-speed bomber built for the Air Ministry, fitted with two Bristol "Jupiter" engines. It is not permitted as yet to publish any details. It is of all-steel construction.



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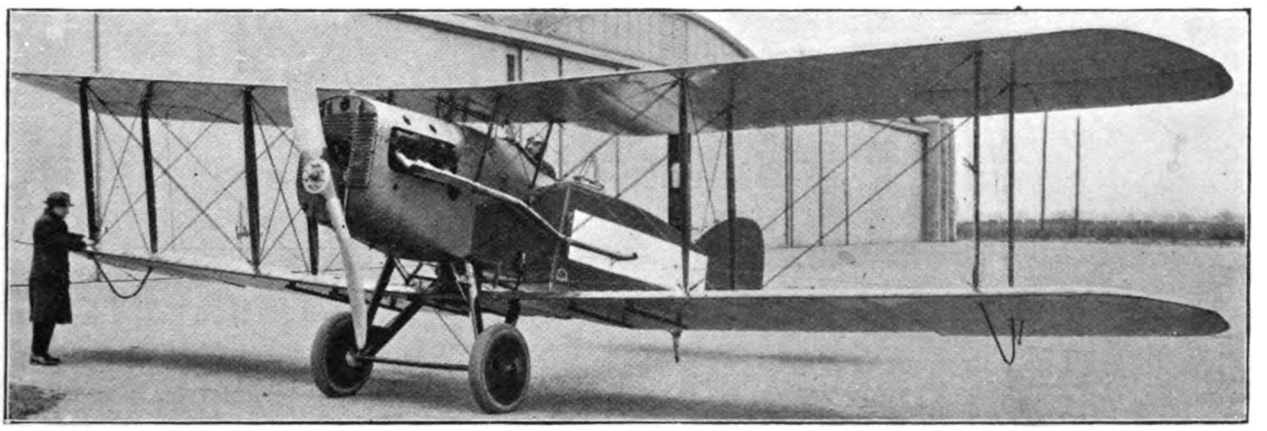
BRISTOL.



The Bristol "Fighter" with 300 h.p. Hispano-Suiza, which has been supplied to many foreign Air Services.

The Bristol Aeroplane Co., Ltd.

Formerly known as The British and Colonial Aeroplane Co., Ltd., Filton House, Bristol. The first great British aeroplane firm. Founded in 1910, by the late Sir George White, Bart., a pioneer of electric tramways. Have very extensive works on the outskirts of Bristol, where they manufacture "Bristol" aeroplanes of the firm's own design.

Chairman, Mr. Samuel White, J.P. Managing Director, Sir G. Stanley White, Bart. Secretary and Director, Sir Henry White-Smith, K.B.E. Works Manager, Mr. Herbert Thomas. Chief designer, Capt. F. Barnwell.

The Bristol "Fighter," designed by Captain Frank Barnwell, was recognised during the war as one of the most effective and efficient fighter machines yet produced in any country.

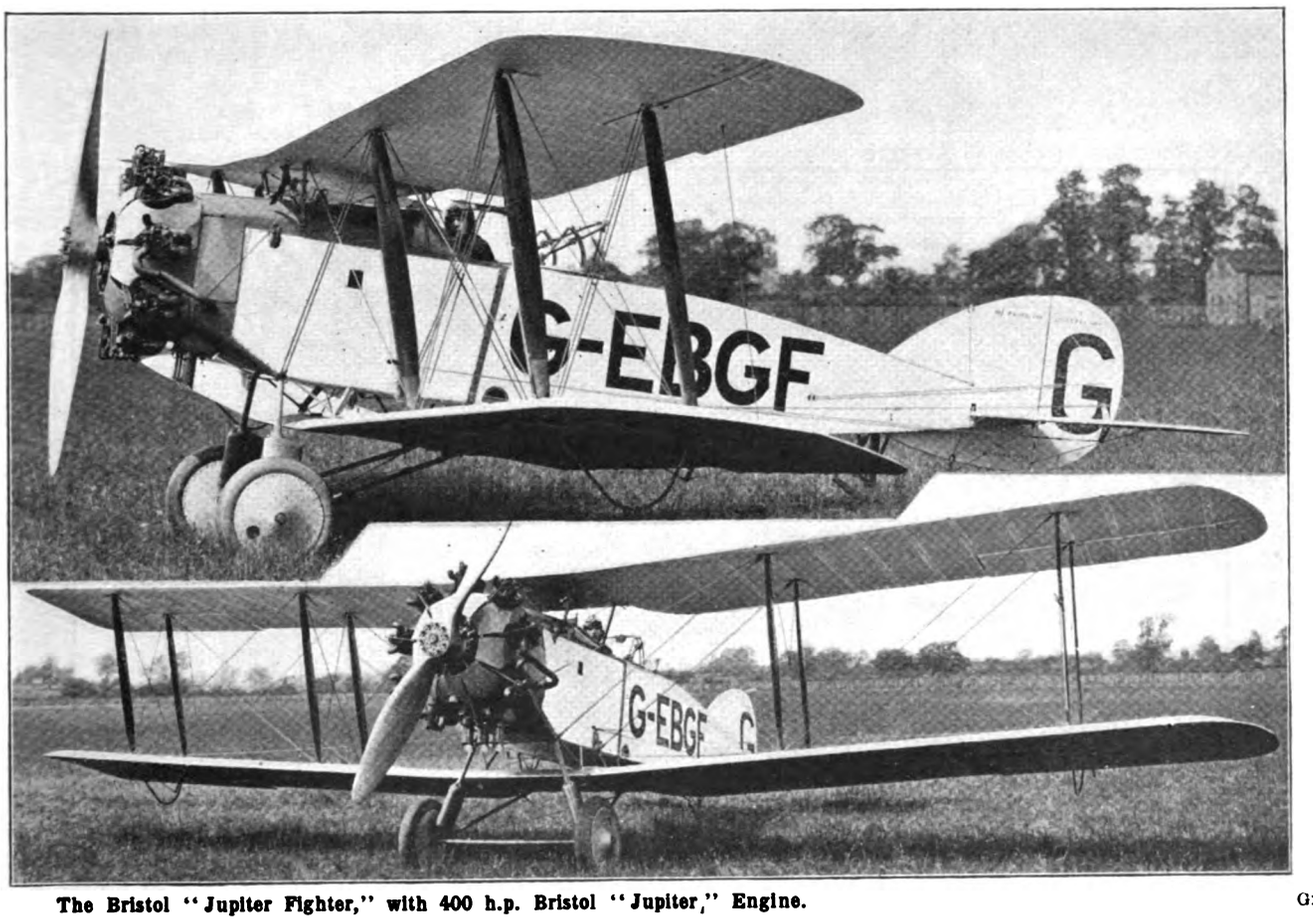
With the coming of peace, the firm naturally have set their house in an order appropriate to the changed conditions, and the following details of their more recent machines will give an idea of their preparedness for the demands of to-morrow.

THE "JUPITER FIGHTER."

The Bristol Company are now putting on the market a modification of the well-known "Fighter" fitted with their 400 h.p. Bristol "Jupiter" engine. General dimension and arrangement and all the excellent features of the original "Fighter" are retained, but with the much more powerful engine now fitted the performance has greatly improved and the machine in its new form can certainly be considered as formidable a fighting instrument to-day as the original "Fighter" was when it was first produced.

Specification of the Bristol "Jupiter Fighter."

Length	**25 ft. (7.63 m.).**
Span	**39 ft. 3 in. (12.0 m.).**
Height	**10 ft. 0 in. (3.05 m.).**
Weight empty	**1,860 lbs. (847 kgs.).**
Petrol	**524 lbs. (238 kgs.).**
Oil	**73 lbs. (33 kgs.).**
Crew	**360 lbs. (167 kgs.).**
Military load	**533 lbs. (252 kgs.).**
Total weight	**3,350 lbs. (1,537 kgs.).**



The Bristol "Jupiter Fighter," with 400 h.p. Bristol "Jupiter," Engine.

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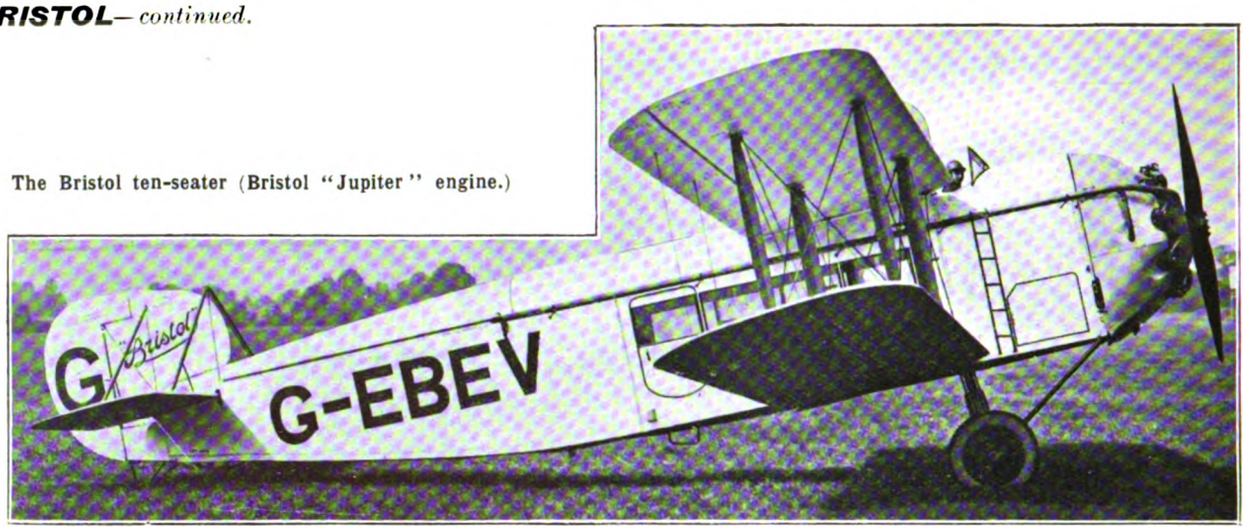
BRISTOL— *continued.*

The Bristol ten-seater (Bristol "Jupiter" engine.)



Wing loading	**8.27 lbs./sq. ft. (40.3 kgs./sq. m.).**
Power loading	**(8.37 lbs./h.p.) (3.82 kgs./h.p.).**
Speed low down	**133 m.p.h. (215 km./h.)**
Speed at 10,000 ft. (3,050 m.) ..	**129 m.p.h. (208 km.h.).**
Climb to 10,000 ft. (3,050 m.) ..	**8.25 mins.**
Ceiling	**22,500 ft. (6,850 m.).**

THE BRISTOL TEN-SEATER.

The Bristol "Ten-seater" is a single-engined biplane, fitted with the 400 h.p. Bristol "Jupiter" air-cooled engine, designed to carry eight passengers, pilot and mechanic.

The saloon seats six passengers facing forwards, and two others facing aft. Windows, which can be opened, are fitted the full length of both sides of the cabin, and two emergency exits are provided in the roof. Heating is provided by means of hot-air muffs round the exhaust pipes. The internal dimensions of the saloon are: length, 10 ft. 6 ins.; height at centre, 5 ft. 9 ins.; width, 4 ft.

The pilot and mechanic are seated in a cockpit ahead of the front spar of the top plane. Below the cockpit is a luggage compartment 4 ft. 6 ins. long by 4 ft. wide by 2 ft. 6 ins. high.

Two main petrol tanks, each of 50 gallons capacity, are carried on top of the wings. The petrol feed is by gravity.

A steel fireproof bulkhead is fitted behind the engine, and all control connections pass through glands. The engine-mounting is hinged ahead of the bulkhead, and may be swung out for access to its accessories.

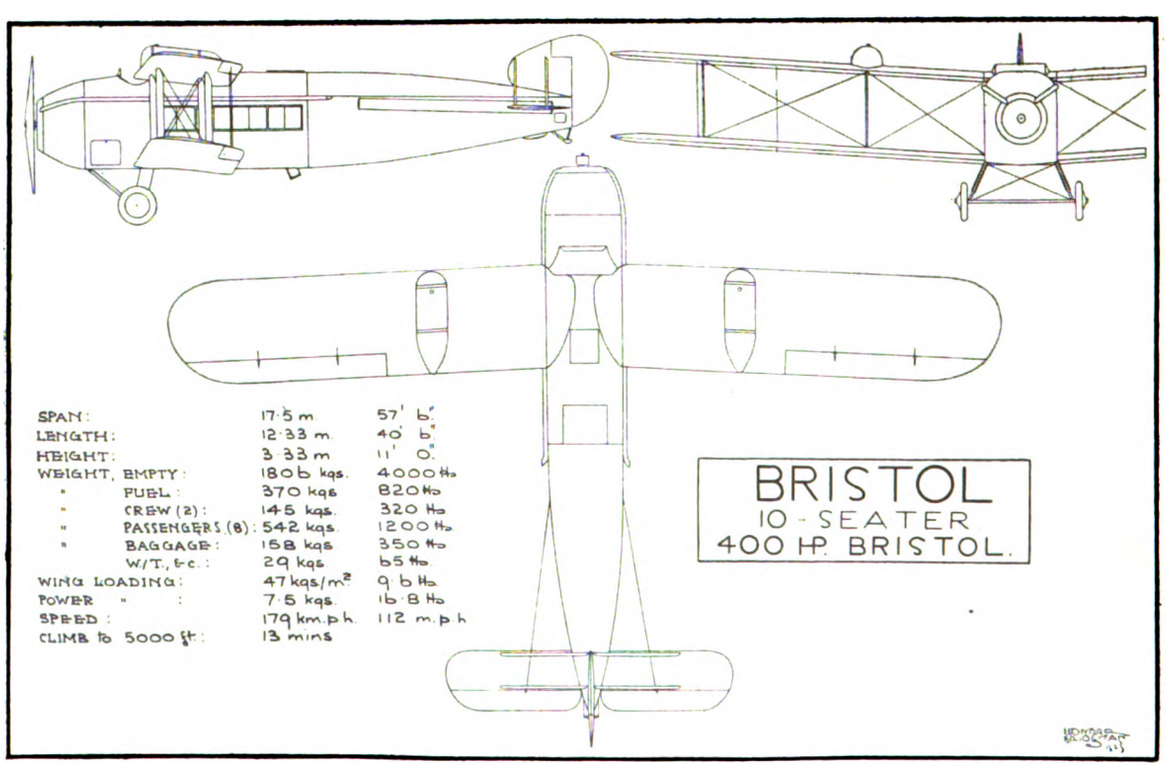
The undercarriage is of the two-wheeled oleo-elastic type. The oleo plungers are fitted with a tapered needle valve to control the passage of the oil through the plunger to give constant oil pressure throughout the stroke of eight inches.

The tail incidence can be varied by a lever and quadrant adjacent to the pilot to trim the machine under all conditions of speed and load distribution.

The machine has an economical cruising speed, loaded, of 95 m.p.h. (152 km.h.), at which speed the fuel consumption is 26 gallons (120 litres) of petrol per hour.

THE BRISTOL FREIGHT CARRIER.

The "Jupiter"-engined machine described above has also been produced without seating accommodation for passengers, for the carriage of freight in quantity. The overall dimensions and the general design do not differ from those of the passenger carrier, and the machine is capable of carrying about 1,800 lbs. of goods.


SPAN: 17·5 m. 57' 6"
LENGTH: 12·33 m. 40' 6"
HEIGHT: 3·33 m 11' 0"
WEIGHT, EMPTY: 1806 kgs. 4000 lbs
" FUEL: 370 kgs 820 lbs
" CREW (2): 145 kgs. 320 lbs
" PASSENGERS (8): 542 kgs. 1200 lbs
" BAGGAGE: 158 kgs 350 lbs
W/T, &c.: 29 kgs 65 lbs
WING LOADING: 47 kgs/m² 9 lbs
POWER " : 7·5 kgs. 16·8 lbs
SPEED: 179 km.p.h. 112 m.p.h
CLIMB to 5000 ft: 13 mins
BRISTOL
10-SEATER
400 HP. BRISTOL.

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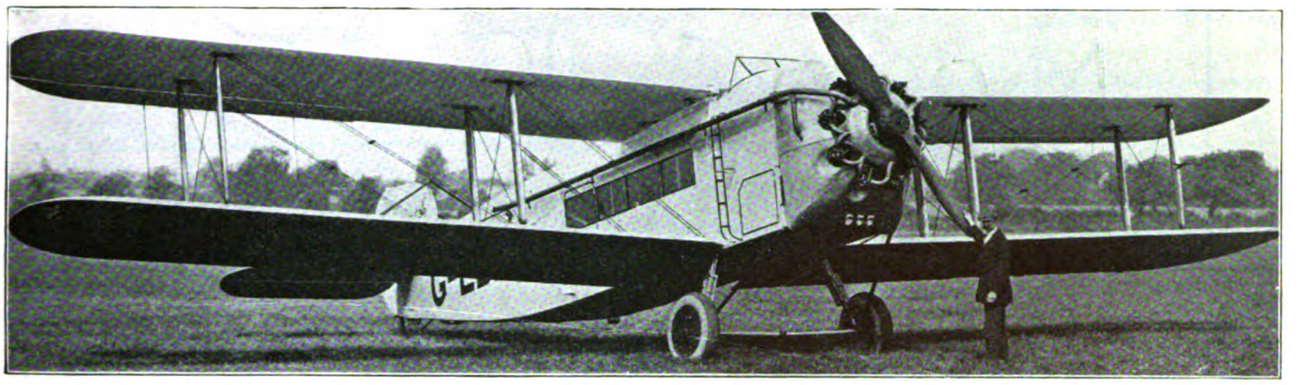
BRISTOL—*continued.*



The Bristol Freight Carrier (400 h.p. Bristol "Jupiter" engine).

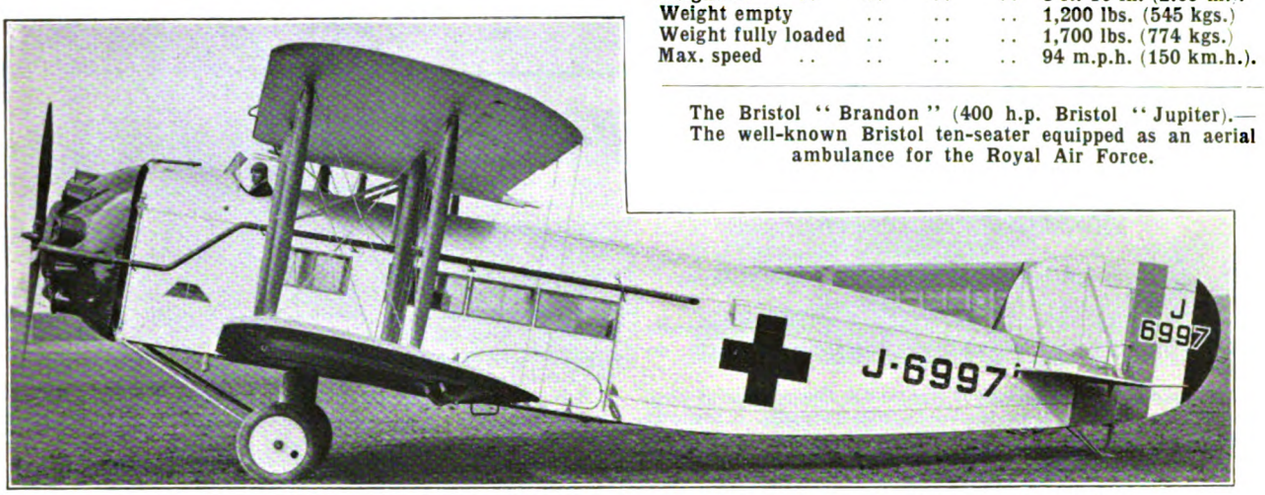
THE BRISTOL "BRANDON."

This is to all intents and purposes the ten-seater with "Jupiter" engine, but has the cabin fitted for ambulance purposes. The cabin accommodates two stretcher cases and four seated patients. A special entrance to allow the stretchers to be admitted is arranged in the side of the fuselage, opposite to the ordinary side entrance door.

The two seats are arranged tandem fashion, both behind the upper rear spar, and dual control is fitted. The engine is carried on a Bristol swinging mounting, rendering it unusually easily accessible, and an oleo-pneumatic undercarriage is fitted.

Specification.

Span	**31 ft. (9.45 m.).**
Length	**23 ft. 3 in. (7.07 m.).**
Height	**8 ft. 10 in. (2.69 m.).**
Weight empty	1,200 lbs. (545 kgs.)
Weight fully loaded	1,700 lbs. (774 kgs.)
Max. speed	94 m.p.h. (150 km.h.).



The Bristol "Brandon" (400 h.p. Bristol "Jupiter").—The well-known Bristol ten-seater equipped as an aerial ambulance for the Royal Air Force.

THE BRISTOL SCHOOL MACHINE.

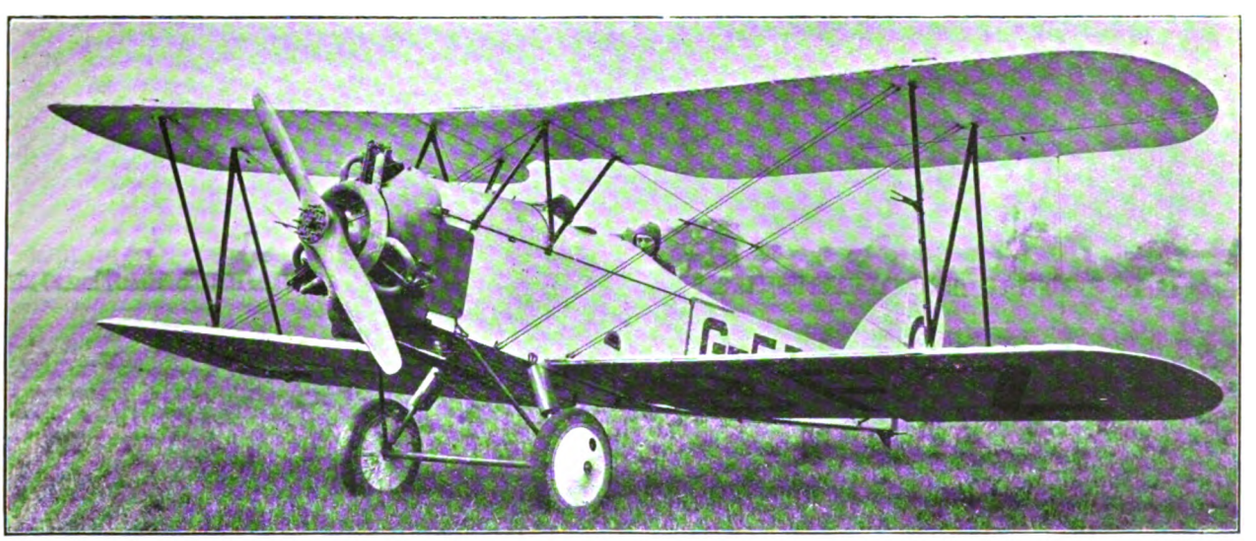
A small two-seater suitable for school and training purposes, fitted with the Bristol "Lucifer" engine of 100 h.p.

It is a single-bay biplane with interchangeable upper and lower wings, and with "N" type interplane struts, which reduce to a minimum the amount of trueing up required either in erection or in service.

THE BRISTOL "TAXI-PLANE."

This is a machine similar to the School machine, but intended for light commercial purposes. It has two side-by-side seats behind the pilot's cockpit and a side door to these seats. It was described in the last volume of this annual, and a scale drawing is reproduced on the next page.

Incidentally, this drawing is fairly indicative of the School machine, except in regard to the seating arrangement.



The Bristol School Biplane (100 h.p. Bristol "Lucifer" engine).

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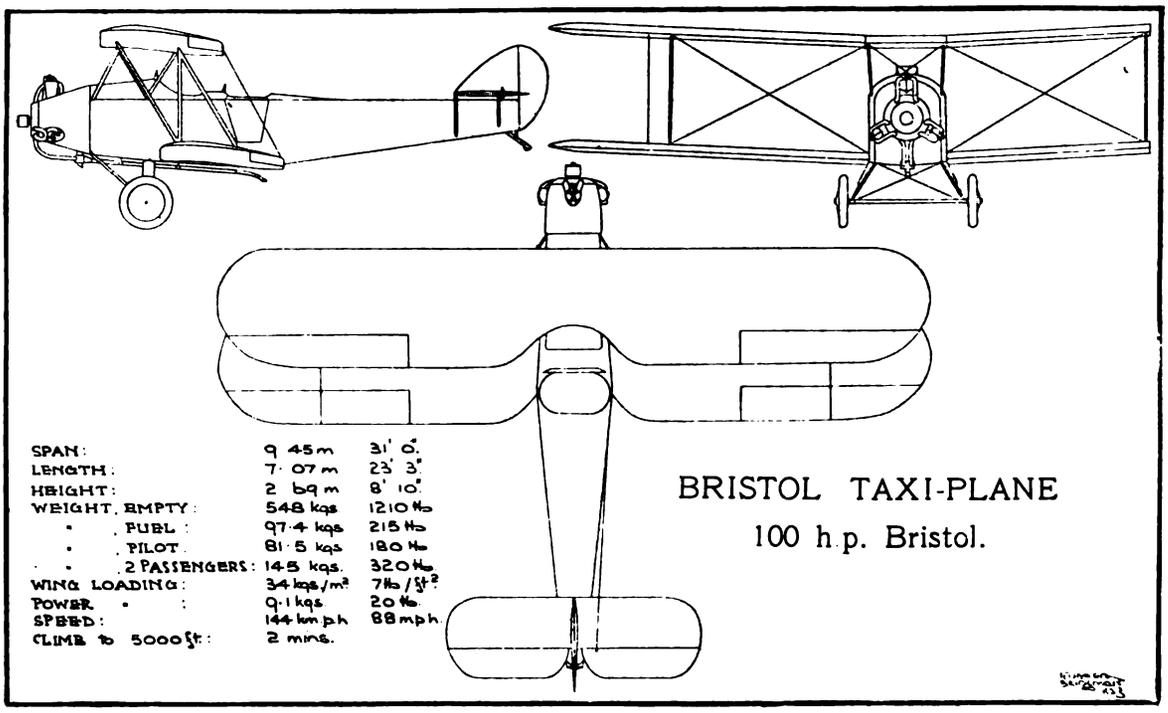
BRISTOL—*continued.*


BRISTOL TAXI-PLANE
100 h.p. Bristol.
SPAN: 9·45 m 31' 0"
LENGTH: 7·07 m 23' 3"
HEIGHT: 2·69 m 8' 10"
WEIGHT, EMPTY: 548 kgs 1210 lbs
" , FUEL: 97·4 kgs 215 lbs
" , PILOT: 81·5 kgs 180 lbs
" , 2 PASSENGERS: 145 kgs. 320 lbs
WING LOADING: 34 kgs/m² 7 lbs/ft²
POWER " : 9·1 kgs 20 lbs
SPEED: 144 km p.h 88 m.p.h.
CLIMB to 5000 ft: 2 mins.

THE BRISTOL "BULLFINCH."

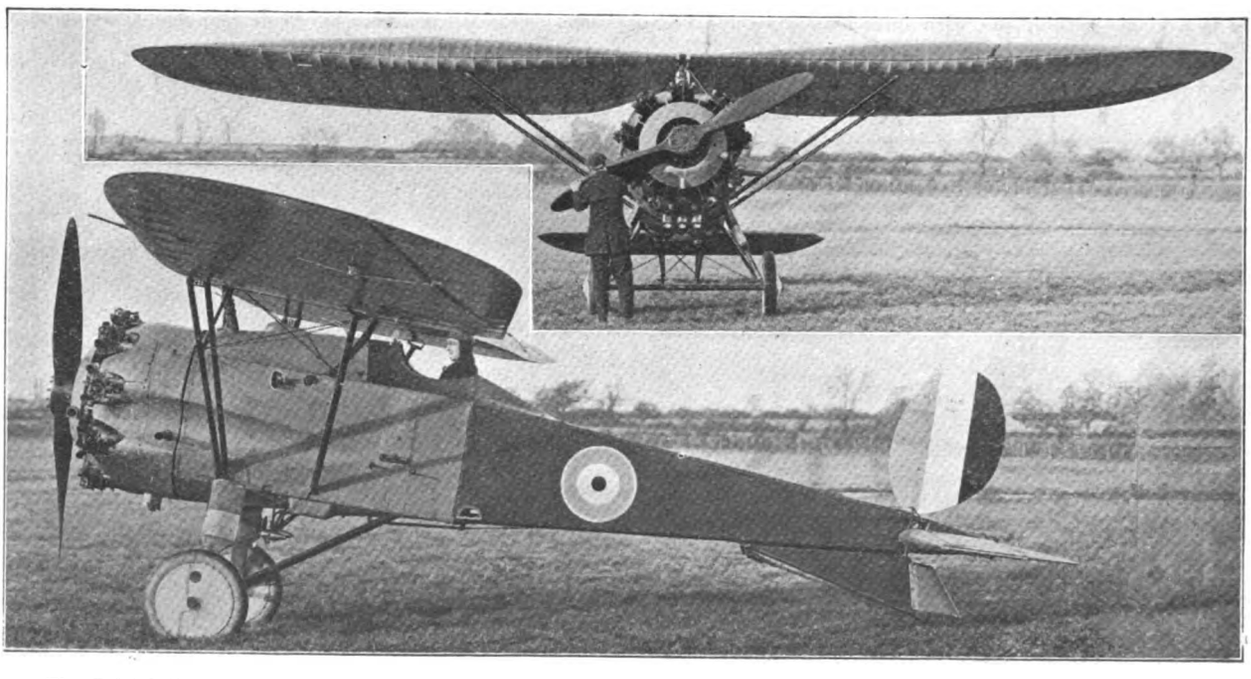
This machine, shown in a photograph on this page, is a new single-seater fighter fitted with the 400 h.p. Bristol "Jupiter" engine.

As can be seen, it is a monoplane, with rigid bracing struts from the fuselage out to about one-third of the half span on each side.

At the point of attachment of the struts, the wing is of very thick section and tapers in thickness from there, both towards the tips and towards the centre. The pilot sits just behind the rear spar, with his eyes in the plane of the wing, and the thinning down of the section here greatly increases the range of his vision.

Apart from its wing arrangement (the "Bullfinch" is the first military monoplane built for the British Air Force since the 1915 Bristol monoplane), the only obvious features of interest are the curious twin fins and tail skids entirely below the fuselage, and the lonely-looking balanced rudder above.

Being purely a military machine which is still in the experimental stage, it is not permissible to publish any details of this machine.



The Bristol "Bullfinch" (400 h.p. "Jupiter" engine).

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C

C.A.C.

The Central Aircraft Co., Ltd., 179, High Road, Kilburn, N.W.

Built a quantity of aeroplanes and parts to official requirements during the war. The Brothers Cattle, proprietors of the firm, then decided to remain in the aircraft industry in time of peace.

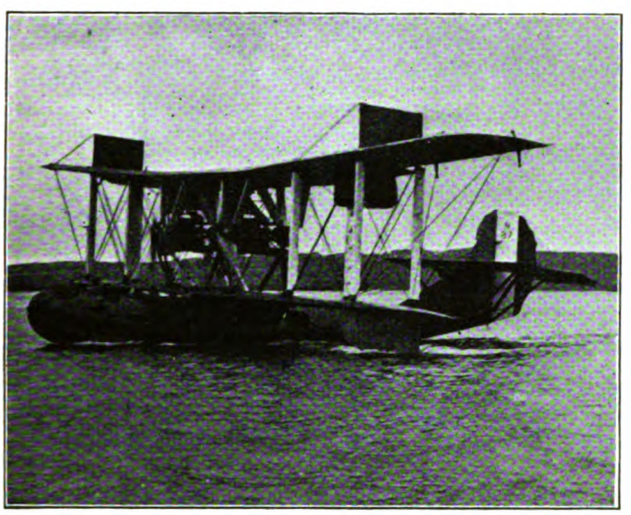
The firm built a number of aircraft after the war which were known under the general type designation of "Centaur."

These machines have all been described in previous issues of this annual. They were of robust and simple design and were very suitable for their purpose. Some number of the "Centaur 4" type is actually in use in training squadrons of the Belgian Air Service.

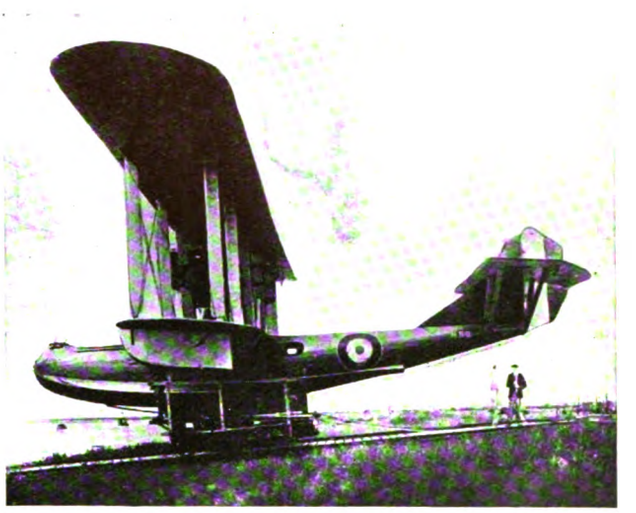
The firm has at present in course of construction an extremely interesting little two-seater triplane designed to take the 45 h.p. Anzani engine, which, fitted with another engine, may be completed for this year's Air Ministry Light Aeroplane Trials, and have carried out quite a large amount of aeronautical work for other firms, as contractors, including that of constructing a singularly well finished glider for the 1922 Daily Mail Competition. In the present state of the aircraft trade, the Central Aircraft Co. do not consider that they are justified in embarking on any wide programme of independent design, but there is no doubt that when better conditions prevail they will resume this activity.

E

ENGLISH ELECTRIC CO.



An E.E.C. P.5 Flying Boat afloat.



An E.E.C. P.5 "Cork" Flying Boat (two Rolls-Royce 360 h.p. engines) on the slipway.

The English Electric Co., Ltd.

Aircraft Department. Offices: Queen's House, Kingsway, London. Works: Phœnix Works, Bradford, and Dick, Kerr Works, Preston, Lancs.

This well-known engineering company was formed to amalgamate the interests of the following noted companies:—Dick, Kerr & Co., Ltd., Preston; Phœnix Dynamo Manufacturing Co., Ltd., Bradford; Coventry Ordnance Works, Ltd.; Willans & Robinson, Ltd., Rugby; Siemens Dynamo Works, Stafford.

The three first-mentioned firms have had extensive experience of aircraft construction and design, while the fourth was engaged during the war in the production of aircraft engines.

In the case of the Coventry Ordnance Works this experience dates back to 1911 and 1912, when aeroplanes designed and constructed by them were entered for the military trials competition. Mr. W. O. Manning, who was responsible for the design of these machines, became aircraft designer to the Phœnix Dynamo Works during the war and remains with the English Electrical Co.

During the war, at their Phœnix Works, Bradford, and Dick, Kerr Works, Preston, this company was the largest producer of flying-boats in the country, and it is on this type of machine that the company's post-war activities have been centred. The flying-boats constructed by them range from 7,000 to over 30,000 lbs. displacement.

THE P.5.

As a result of experience gained during the war, the firm have concentrated on flying-boats fitted with flexible type hulls, which have proved themselves superior in performance and durability to the rigid hulls fitted to the F.3, F.5, and similar type machines so largely used during hostilities. In particular, their P.5 "Cork" machine may be mentioned. This machine has a total weight of 12,000 lbs., is fitted with a 45 ft. flexible type hull, and is admittedly the finest twin-engined flying-boat yet produced, while it is understood that the later series now being manufactured have been still further improved, the hulls being fitted with double bottoms divided into several water-tight compartments by flexible bulkheads.

Specification of the P.5 "Cork" Flying-Boats.

Mark I.	
Span	**85 ft. (25 m. 90).**
Length	**49 ft. (14 m. 80).**
Height	**21 ft. (6 m. 40).**
Engines	**2 Rolls-Royce "Eagle." 360 h.p. each.**
Weight loaded	**11,500 lbs. 5,230 kgs.).**
Weight empty	**7,000 lbs. (3,180 kgs.).**
Disposable load	**4,500 lbs. (2,050 kgs.).**
Maximum speed	**106 m.p.h. (171 km.h.).**
Cruising speed	**90 m.p.h. (145 km.h.).**
Range at cruising speed	**800 miles (1,285 km.).**
Mark II.	
Span	**85 ft. (25 m. 90).**
Length	**53 ft. (16 m. 15).**
Height	**21 ft. (6 m. 40).**
Engines	**2 Napier "Lion," 450 h.p. each.**
Weight loaded	**13,900 lbs. (6,320 kgs.).**
Weight empty	**8,400 lbs. (3,810 kgs.).**
Disposable load	**5,500 lbs. (2,510 kgs.).**
Maximum speed	**115 m.p.h. (185 km.h.).**
Cruising speed	**90 m.p.h. (145 km.h.).**
Range at cruising speed	**800 miles (1,285 km.).**

"THE WREN."

Early in 1923, the English Electrical Co. built, to the designs of Mr. W. O. Manning, to the order of the Director of Research, The Air Ministry, a cantilever monoplane fitted with an A.B.C. motor-bicycle engine of 397 c.c. cylinder capacity, and nominally of 3 h.p.

This machine, which follows glider practice in general, is well shown in the photographs reproduced. It is entirely built of timber, with the exception of the engine mounting which is of steel tube.

The wing is a thick flat-bottomed section, tapering both in plan and in depth of camber, and of very high aspect ratio. The fuselage is of normal rectangular section, with the pilot

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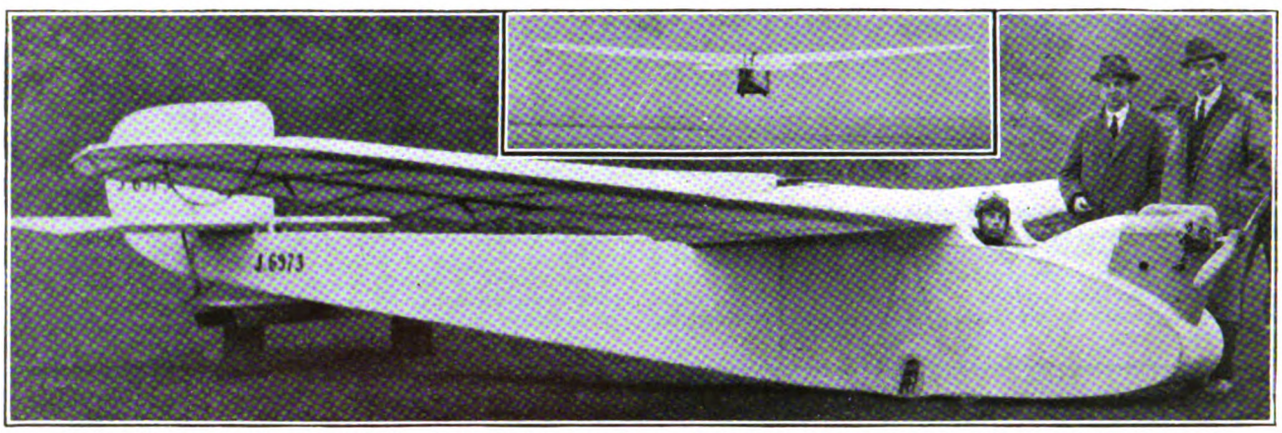
E.E.C.—*continued.*



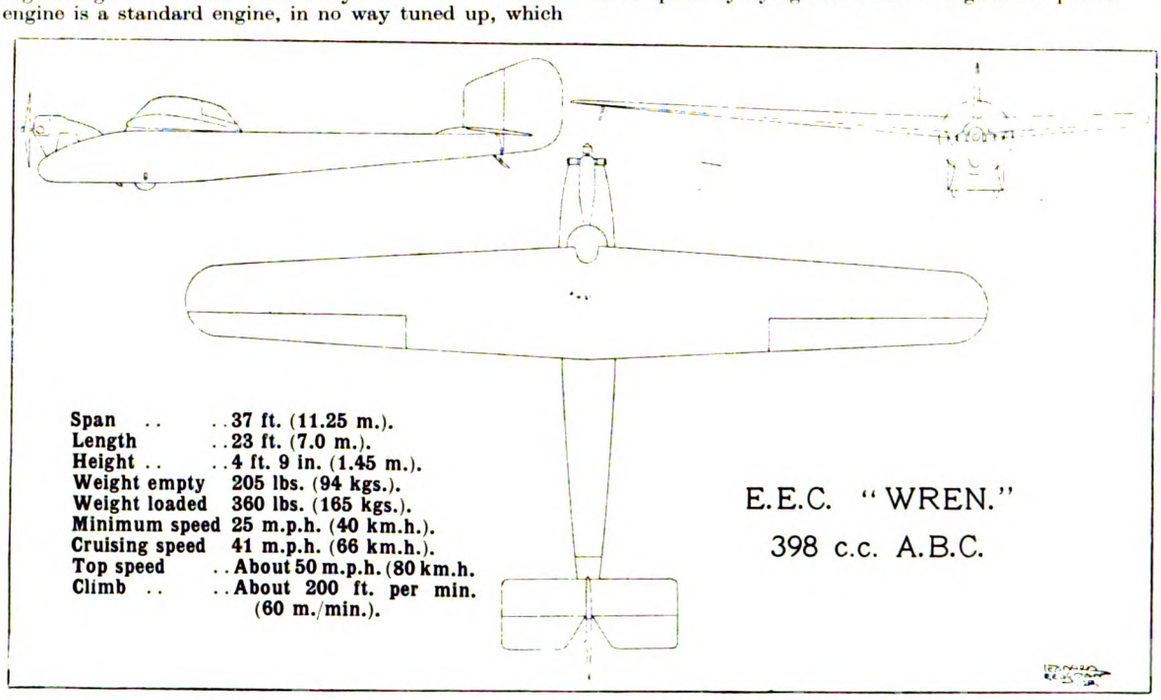
THE "WREN."—The designer, Mr. W. O. Manning, is seen on the extreme right and the Air Ministry's test pilot, S/Ldr. Maurice Wright, is in the pilot's seat. Inset, the machine is seen in the air.

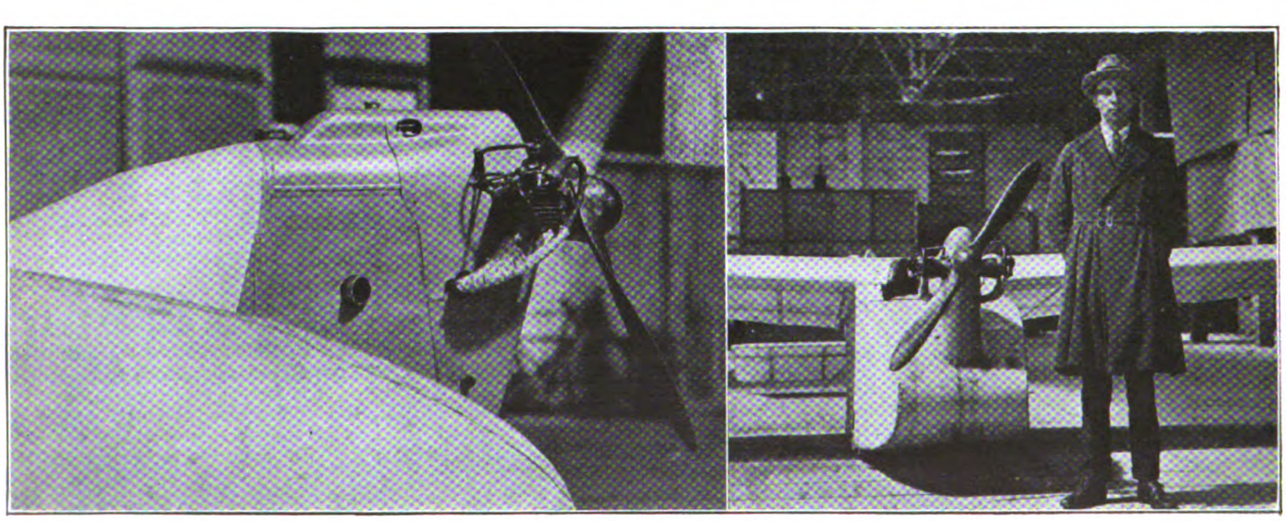
seated ahead of the wing and his head let into the leading edge. The fuselage slopes down from his seat to the fore end, and the engine is mounted on a narrow structure projecting up from the nose of the fuselage.

The undercarriage consists of an axle across the bottom of the fuselage, rubber-sprung at its outer ends, and carrying a pair of 12 in. dia. wheels, with rather less than half their diameter projecting through the bottom of the body.

The engine is a standard engine, in no way tuned up, which has been fitted with a thrust race on the crankshaft, and drives directly a 3 ft. 6 in. dia. airscrew. The maximum speed on the ground is 2,600 r.p.m.—at which speed the engine develops not more than 6 to 7 h.p.

Two of these machines were entered for the Light Aeroplane Competitions at Lympne, October, 1923, and one of them, flown by Fl.-Lt. Longton, tied in the contest for the "Daily Mail" £1000 prize by flying 87.5 miles on 1 gallon of petrol.


Span .. ..37 ft. (11.25 m.).
Length ..23 ft. (7.0 m.).
Height .. ..4 ft. 9 in. (1.45 m.).
Weight empty 205 lbs. (94 kgs.).
Weight loaded 360 lbs. (165 kgs.).
Minimum speed 25 m.p.h. (40 km.h.).
Cruising speed 41 m.p.h. (66 km.h.).
Top speed ..About 50 m.p.h. (80 km.h.
Climb .. ..About 200 ft. per min. (60 m./min.).
E.E.C. "WREN."
398 c.c. A.B.C.



Two views of the engine mounting of the "Wren," giving an idea of the size of the engine.

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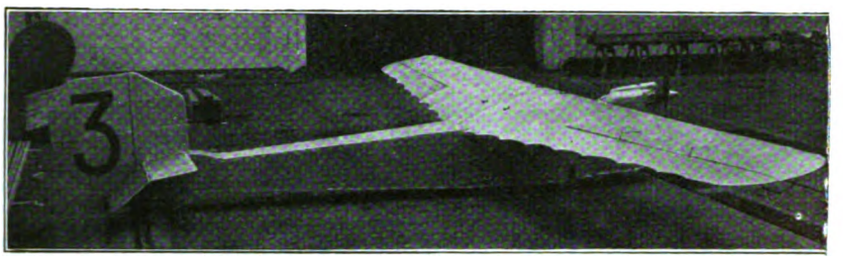
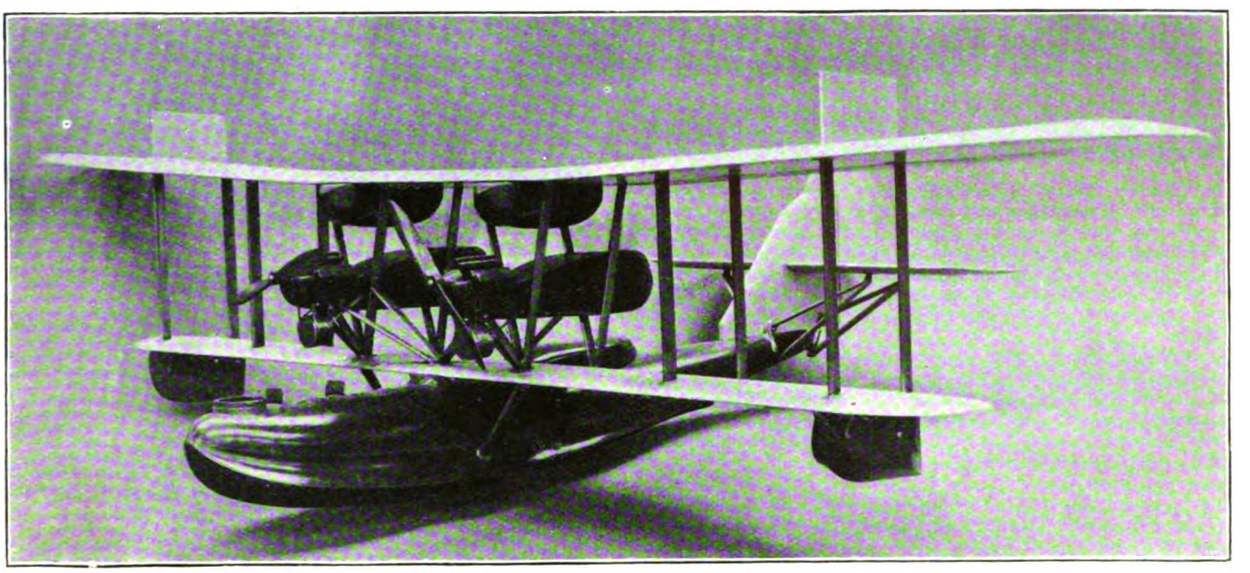
E.E.C.—*continued.*



The E.E.C. "Wren." This photograph shows the "Wren" flown at the British Light Aeroplane Competition at Lympne by Sq.-Ldr. M. E. A. Wright. This and the sister machine, flown by Sq.-Ldr. Longton, differ in the form of the fin and rudder and in other minor details from the earlier machine illustrated on the last page.



The Wind Tunnel Model of the E.E.C. "Kingston" (2 Napier "Lion" engines).

THE E.E.C. "KINGSTON."

A large twin engine flying-boat which is in most respects a direct development of the P.5 "Cork" type, described previously. The photograph here reproduced of the wind-tunnel model is all that it is permissible to publish at present, except that the machine has Napier "Lion" engines.

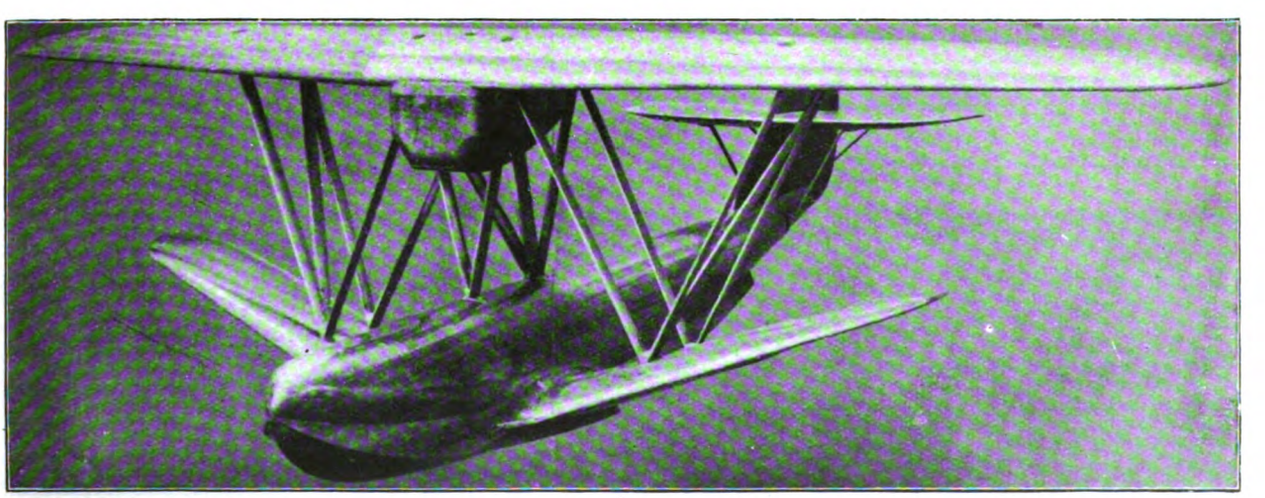
THE E.E.C. "AYR."

The photograph reproduced below is of the wind-tunnel model of the experimental flying-boat, known as the "Ayr," which is an attempt to overcome certain of the difficulties encountered in practice with the single hull type of flying-boat.

This type of machine is laterally unstable afloat and requires therefore wing tip floats. These floats are of appreciable weight and resistance, impose large loads on the wings when the boat rolls, and in order to carry them at all the lower wing has to be close to the water level. In consequence the lower wing is subject to damage by water in a rough sea.

In this machine, the lower wing is in effect an extension of the planing bottom of the boat, and is itself a boat-built structure. Its roots are submerged when the boat is afloat, and it gives the hull a large effective beam—thus providing the necessary lateral stability.

The "Ayr" has given very promising results in the model form, and a machine of the type is under construction. It may not be described in detail.



The Wind-Tunnel Model of the E.E.C. "Ayr."

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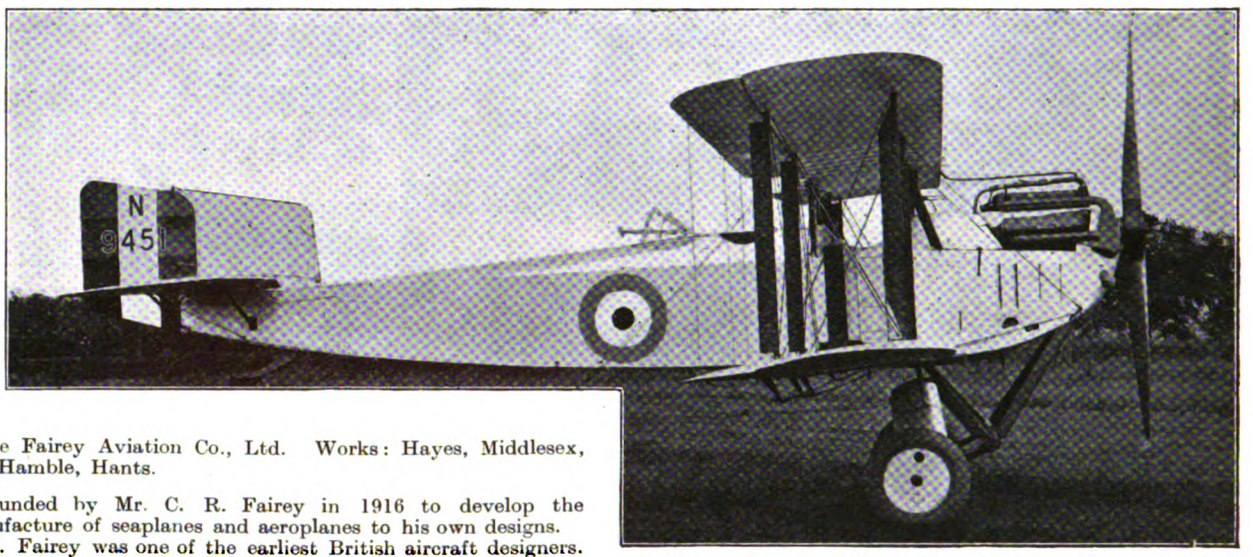
F

FAIREY.



A Fairey type 3 land machine (450 h.p. Napier "Lion") with an oleo-pneumatic undercarriage.

The Fairey Aviation Co., Ltd. Works: Hayes, Middlesex, and Hamble, Hants.

Founded by Mr. C. R. Fairey in 1916 to develop the manufacture of seaplanes and aeroplanes to his own designs.

Mr. Fairey was one of the earliest British aircraft designers. He was associated in 1910-11 with Mr. Dunne in the construction of the experimental Dunne inherently stable machines, and afterwards with Messrs. Short Bros. at Eastchurch, played a very important part in the production of the first practical seaplanes.

Mr. Fairey's chief recent contribution to the art of aircraft design is the practical development of the use of trailing edge flaps as a camber changing device. This arrangement permits of the use of heavy wing loadings on an efficient wing section, which, when the flaps are pulled down and the camber increased, becomes a high lift wing section and makes it possible to start and land slowly.

The first machine upon which this device was successfully used was a modified "Baby" Seaplane—later produced by the firm as the "Hamble Baby."

Built, for war purposes, the very successful range of seaplanes described in the 1920 issue of "All the World's Aircraft."

The last of the war-time machines designed by Mr. Fairey was the gigantic flying-boat then shown in a drawing. This machine is now complete.

THE FAIREY "3D."

The Fairey "3D" seaplane is the only machine of its class which is in general service in the British Royal Air Force, for oversea reconnaissance and general utility purposes. The same type has met with marked favour in the Naval Air Services of other countries.

It is of the twin float biplane type with folding wings, and it is arranged to carry pilot, observer and after-gunner. It may be fitted with either the Rolls-Royce "Eagle" engine of 360 h.p. or the Napier "Lion" of 450 h.p. and in addition the float undercarriage may be removed and an interchangeable oleo-pneumatic land undercarriage may be fitted.

The machine is fitted with the Fairey variable camber flap gear, which permits it, despite the high wing loading, to land at very moderate speeds.

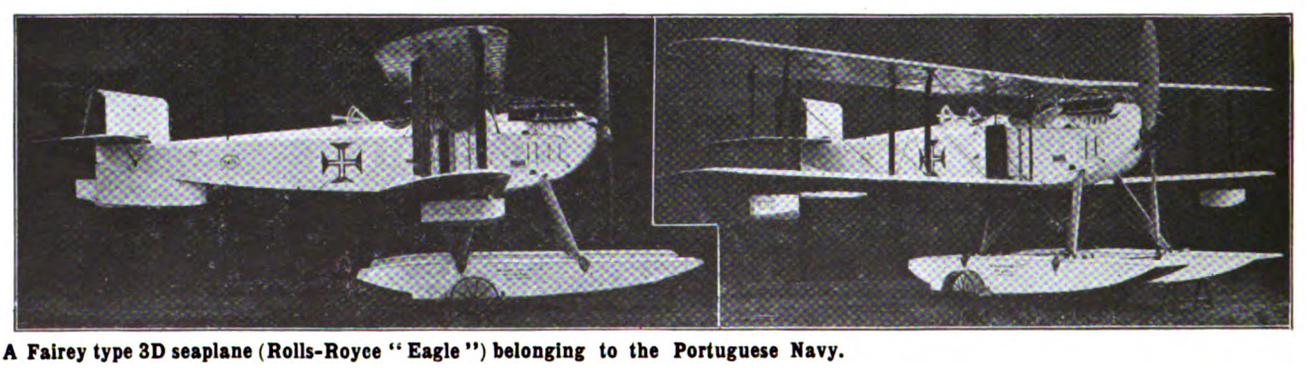
The machine has been designed especially to have a long life and to require the minimum of maintenance under the most severe service conditions, and extreme care has been taken in manufacture to ensure absolute interchangeability of all components and spare parts.

The floats, which are of the double-diagonal-mahogany skin boat-built type, are quickly detachable from the undercarriage.

All metal parts throughout are treated by a special process which renders them rustproof, and the machine is finished with a doping scheme which has demonstrated its suitability for tropical climates.

Specification.

Span	**46 ft. 1½ in. (14.05 m.).**	
Length	**36 ft. (10.97 m.).**	
Height	**13 ft. (3.96 m.).**	
Width folded	**13 ft. (3.96 m.).**	
Useful load	**1,620 lbs. (735 kgs.).**	
Performance as Seaplane.		
Engine	**Rolls-Royce "Eagle."**	**Napier "Lion."**
Max. speed	**101 m.p.h. (162 km.h.).**	**117 m.p.h. (189 km. h.).**
Landing speed	**50 m.p.h. (81 km.h.).**	**50 m.p.h. 81 km.h.).**
Climb to 10,000 ft. (3,050 m.)	**25 mins.**	**12½ mins.**
Ceiling	**16,500 ft. (5,000 m.).**	**19,500 ft. 5,940 m.).**
Endurance at 82 m. (130 km.) per hour	**6½ hours.**	**6½ hours.**
Range	**530 miles (840 km.).**	**530 miles (840 km.).**
Performance as Land Machine.		
Engine	**Rolls-Royce "Eagle."**	**Napier "Lion."**
Top speed	**110 m.p.h. (178 km.h.).**	**120 m.p.h. (194 km.h.).**
Landing speed	**50 m.p.h. (81 km.h.).**	**48 m.p.h. (78 km.h.).**
Climb to 5,000 ft. (1,525 m.)	**10 mins.**	**4 mins. 50 secs.**
Ceiling	**16,500 ft. (5,030 m.).**	**20,000 ft. (6,100 m.).**
Endurance at 92 m.p.h. (148 km.h.)	**6 hours.**	**6 hours.**
Range	**550 miles (885 km.).**	**550 miles (885 km.).**



A Fairey type 3D seaplane (Rolls-Royce "Eagle") belonging to the Portuguese Navy.

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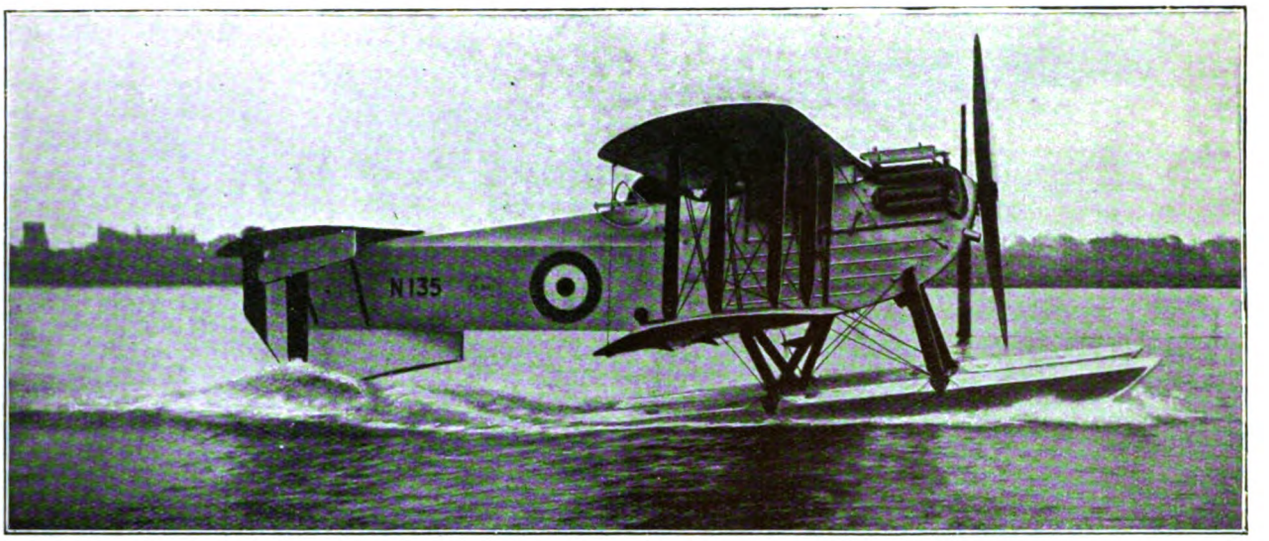
FAIREY—*continued.*



The Fairey Type 21 "Pintail" (Napier engine) with the fixed landing wheels within the floats.

THE FAIREY "PINTAIL" AMPHIBIAN.

The "Pintail," or Fairey type 21, was designed in 1920 and built in 1921, for the Air Ministry. It was a twin-float amphibian and has been described in fair detail in previous issues. Its main characteristics and dimensions are recorded here, as it may be regarded as the prototype of the Fairey "Fawn," hereafter mentioned.

This was the first amphibian machine to succeed in getting off water with wheels fixed in the floats, as distinct from wheels which can be lifted out of the water.

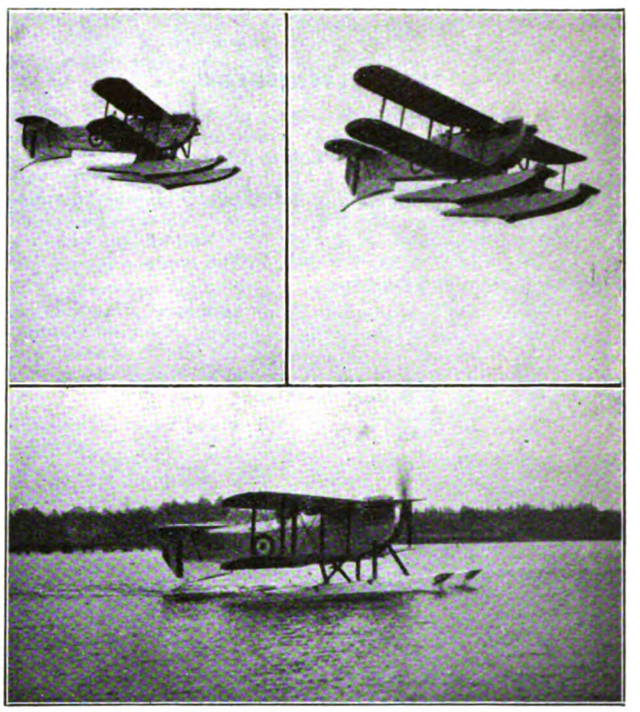
Specification of the Fairey "Pintail" Amphibian, type 21.

Span	**40 ft. (12.2 m.).**
Chord	**6 ft. (1.83 m.).**
Gap	**5 ft. 9 in. (1.75 m.).**
Length overall	**30 ft. (9.15 m.).**
Height	**11 ft. 6 in. (3.5 m.).**
Surface	**440 sq. ft. (47.3 sq. m.).**
Engine type and h.p.	**450 h.p. Napier.**

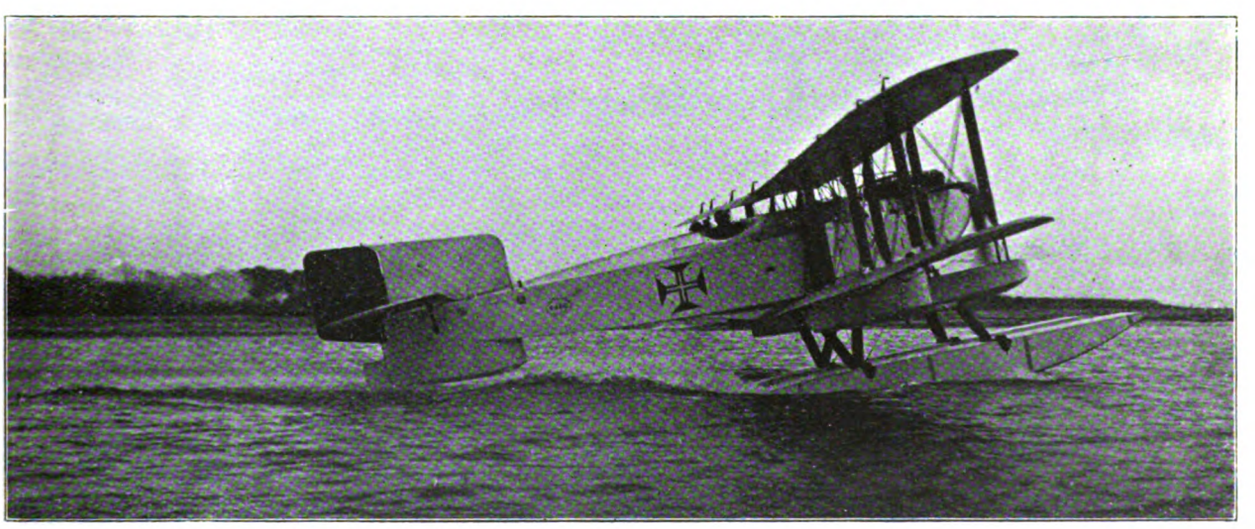
THE FAIREY "TRANSATLANTIC."

This machine, which was built for Captain Saccadura Cabral's flight across the South Atlantic in the summer of 1922, was essentially a type 3 seaplane fitted with enlarged wings and with fuel tanks of special capacity. It will be remembered that this machine made an extraordinarily fine flight from Lisbon to St. Paul's Rocks, on the Equator—thereby fulfilling the most difficult part of her task with extreme success—but was wrecked on landing, through no fault of the machine.

The flight to South America was afterwards continued on standard Fairey 3D seaplanes belonging to the Portuguese Navy.



The Fairey "Pintail" Amphibian.



The Fairey "Transatlantic" Seaplane (360 h.p. Rolls-Royce).

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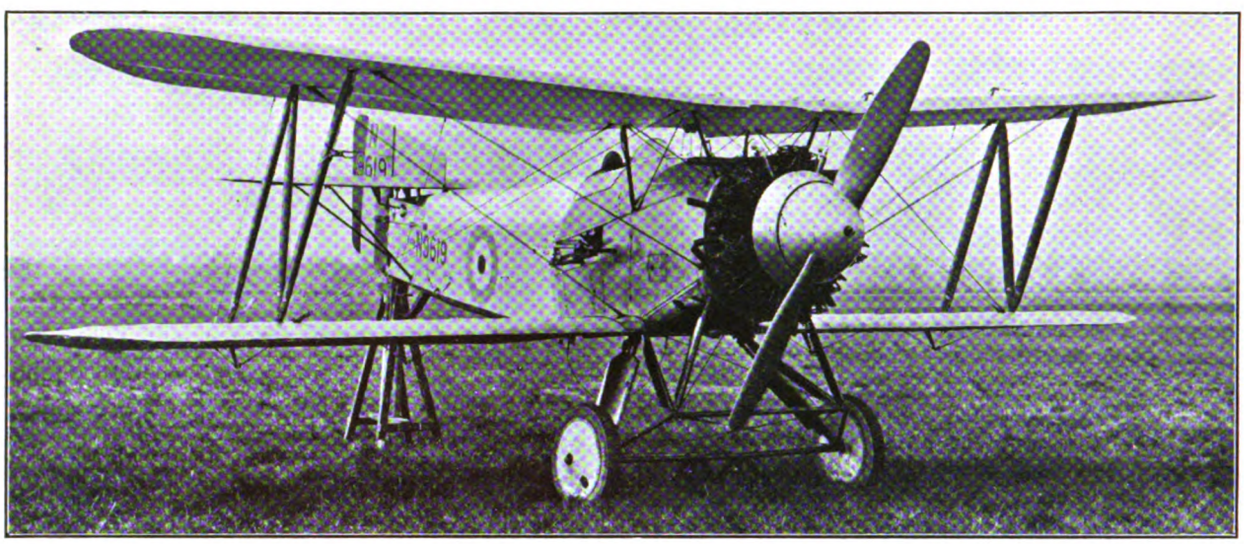
FAIREY—*continued.*

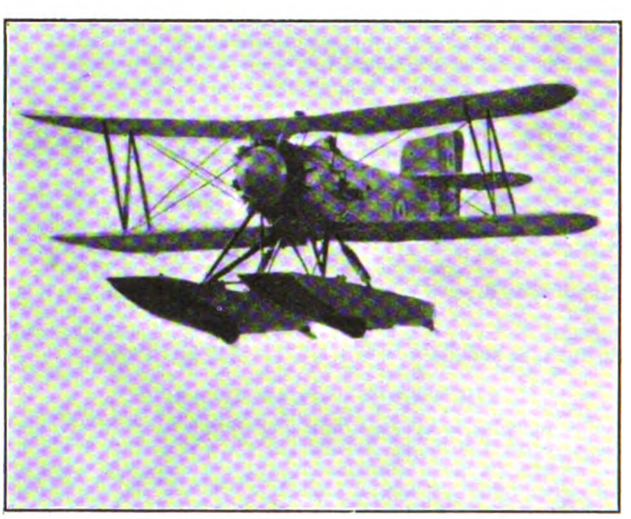


The Fairey "Flycatcher" Single-seat Fighter with Armstrong-Siddeley "Jaguar" engine.

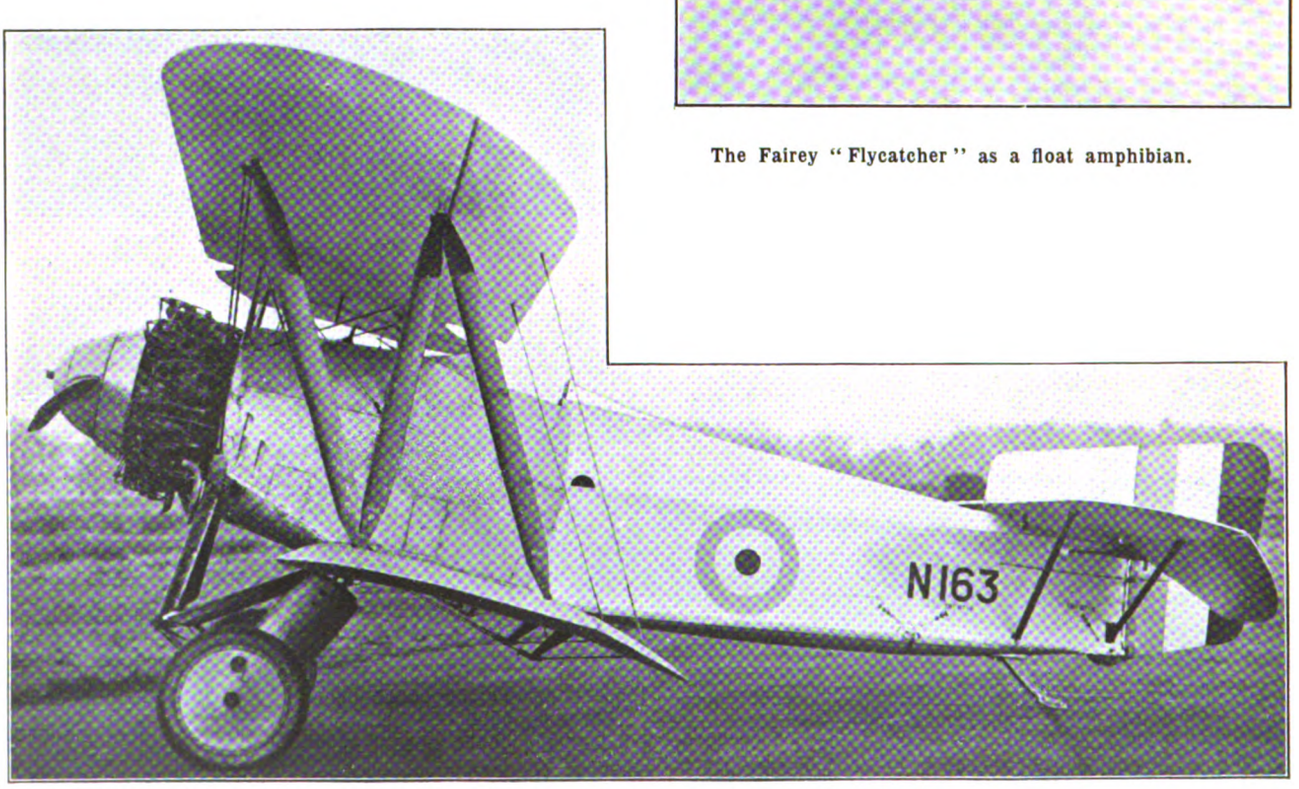
THE "FLYCATCHER."

Another new type which has been produced by the Fairey Aviation Company for the R.A.F. which must not be described in any detail. It is a single-seat fighter fitted with the Armstrong Siddeley "Jaguar" engine of 370 h.p., or alternatively with the Bristol "Jupiter" engine of 400 h.p. Originally intended for deck-flying purposes, the "Flycatcher" has been built both as a land machine and as a twin-float amphibian with the Fairey arrangement of fixed wheels in the floats. It has also the Fairey system of wing-flaps.

The "Flycatcher" is marked by its abnormally low landing speed, by its controllability—which persists when the machine is stalled, and by its extremely high all-round performance, and it is generally regarded as the finest all-round machine of its type yet produced in this country.



The Fairey "Flycatcher" as a float amphibian.



The Fairey "Flycatcher" (370 h.p. Armstrong-Siddeley "Jaguar") as a land machine.

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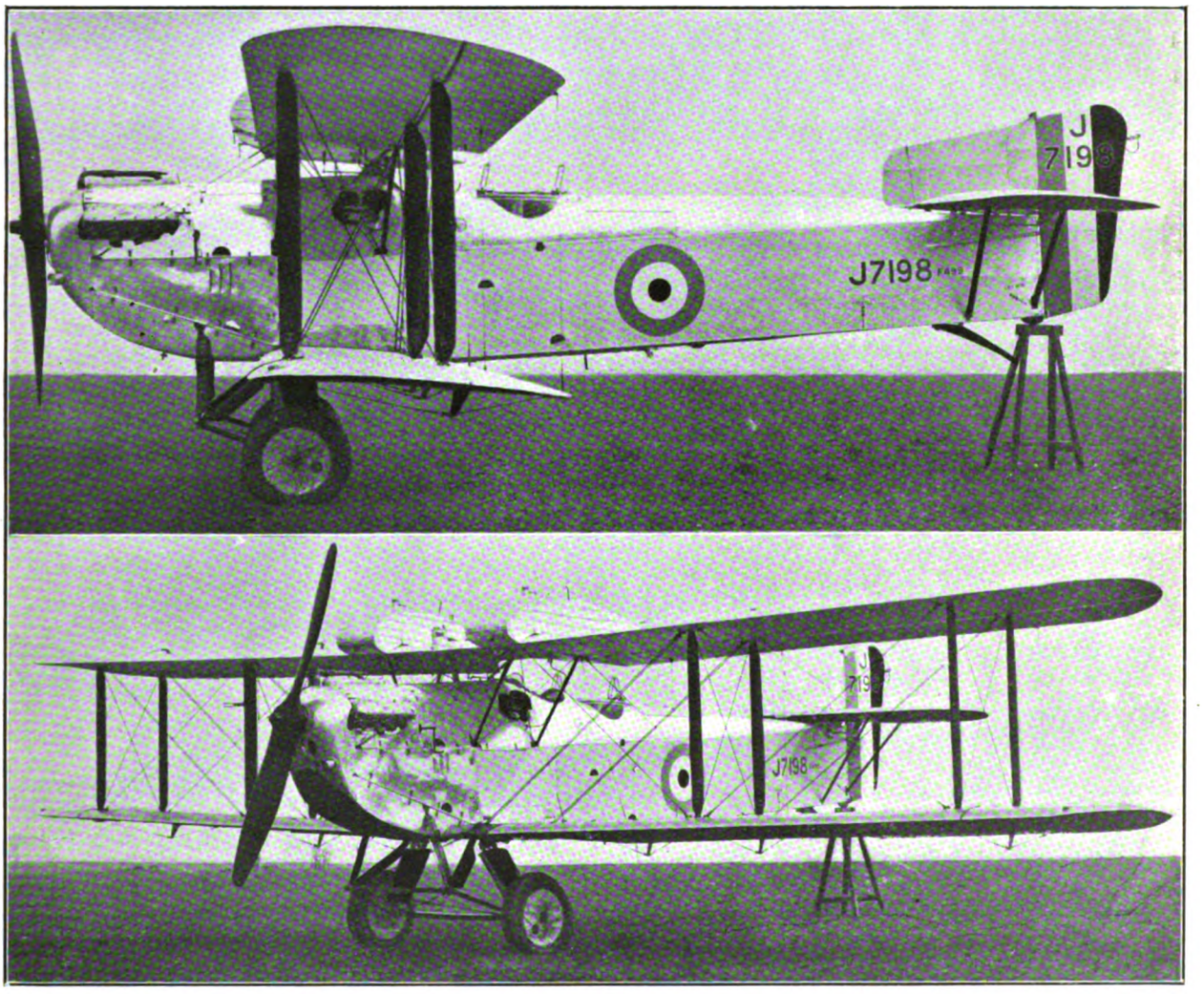
FAIREY—*continued.*

The Fairey "Fawn" (450 h.p. Napier "Lion.")

THE "FAWN."

The Fairey "Fawn" is a two-seat land machine fitted with the 450 h.p. Napier engine, which has been produced in considerable quantity for the R.A.F. It is not at present permissible to give any technical details concerning this type, but it is common knowledge that it has an extremely fine all-round performance, particularly in regard to speed range, and that it is characterized by extreme controllability at low speeds. The machine is to a large extent of metallic construction.



The Fairey "Fawn" (450 h.p. Napier "Lion" engine) fitted with wing petrol tanks and a modified oleo-pneumatic undercarriage.

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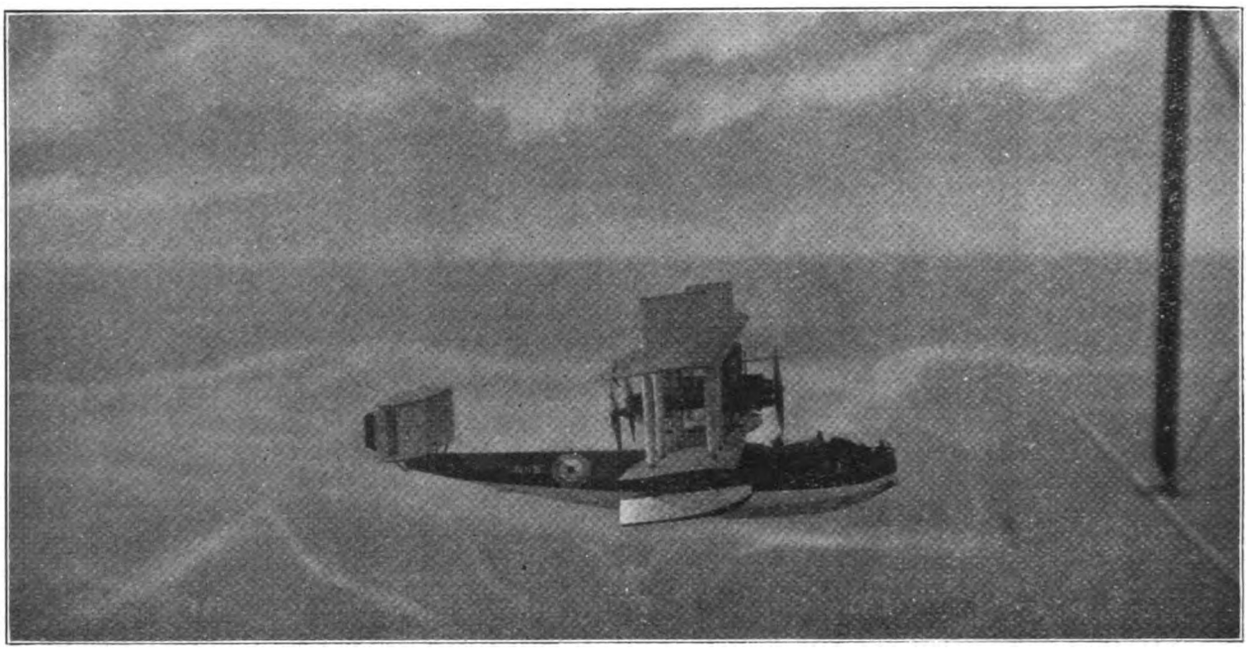
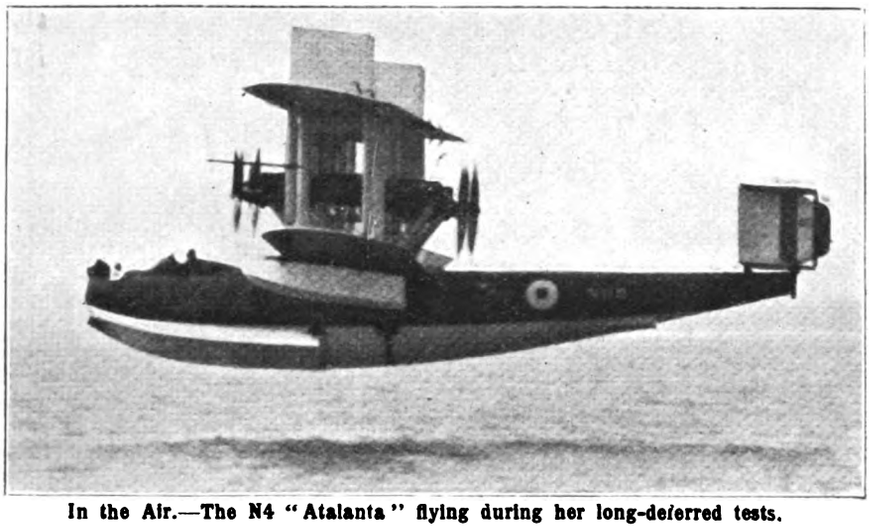
***FAIREY**—continued.*



The World's Biggest Flying Boat.—The Fairey N4 "Atalanta I" (four Rolls-Royce "Condor" engines, 2,400 h.p.).



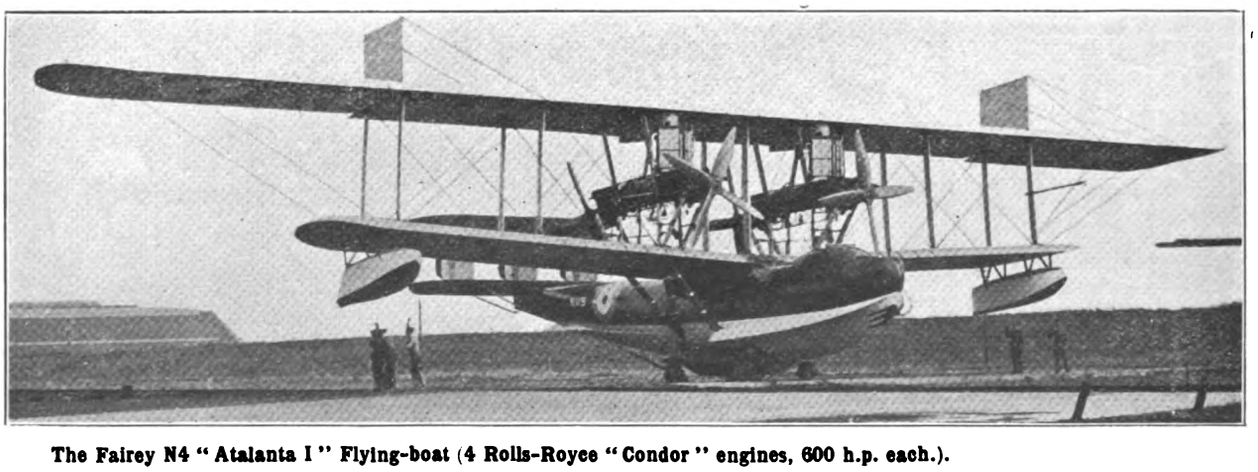
In the Air.—The N4 "Atalanta" flying during her long-deferred tests.

THE N4 "ATALANTA."

A very large flying-boat designed by the Fairey Aviation Company towards the end of the War. After many delays, the first machine of the type was completed and flown during the summer of 1923.

The machine is fitted with four Rolls-Royce "Condor" engines of 600 h.p. each and was designed for co-operation with the fleet at sea. The "Atalanta," as this first of the type is called, is regarded as confidential by the Air Ministry, and detailed information concerning her may not be published.

From a specification which was published four years ago in this annual, it may be gathered that the machine is of 139 ft. span and 66 ft. long overall. The wing area is 2,900 sq. ft. and the original designed full load weight was 30,500 lbs.



The Fairey N4 "Atalanta I" Flying-boat (4 Rolls-Royce "Condor" engines, 600 h.p. each.).

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G

GLOUCESTERSHIRE.

The Gloucestershire Aircraft Co., Ltd., Sunningend Works, Cheltenham.

Mr. A. W. Martyn and Mr. David Longden are joint Managing Directors in this very enterprising firm.

Formed during the War, this firm did valuable work in the manufacture of "Fighters" and other well-tried designs, including "Nighthawks." In 1920 they decided to enlarge their scope and to undertake new constructions to their own designs. They engaged Mr. H. P. Folland, F.R.Ae S., etc., Assistant Chief Designer of the R.A.E. and then Chief Engineer of the British Nieuport Co., first as consultant and later as chief engineer and designer, and in 1921 produced their record-breaking "Bamel" and certain excellent military machines, which are dealt with hereafter.

The firm is giving attention to commercial problems and new designs for civilian aircraft are to be expected in the near future.

THE "BAMEL,"—(Mars I).

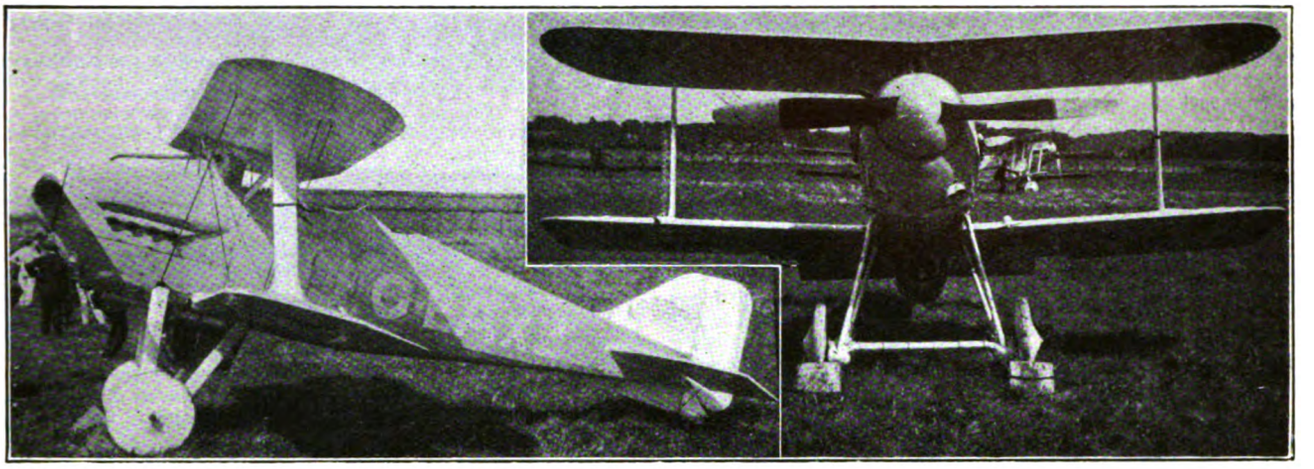
Designed by Mr. H. P. Folland, the "Mars I," as the machine was officially called, bears very obvious signs of its parentage, in that it is very largely constructed of components which form part of previous machines of his design.

The greater part of the fuselage, the undercarriage and the tail unit are constructed from the same component parts as are the same parts of the well-known "Nighthawk," and in external appearance at least are indistinguishable from those of the ancestral machine.

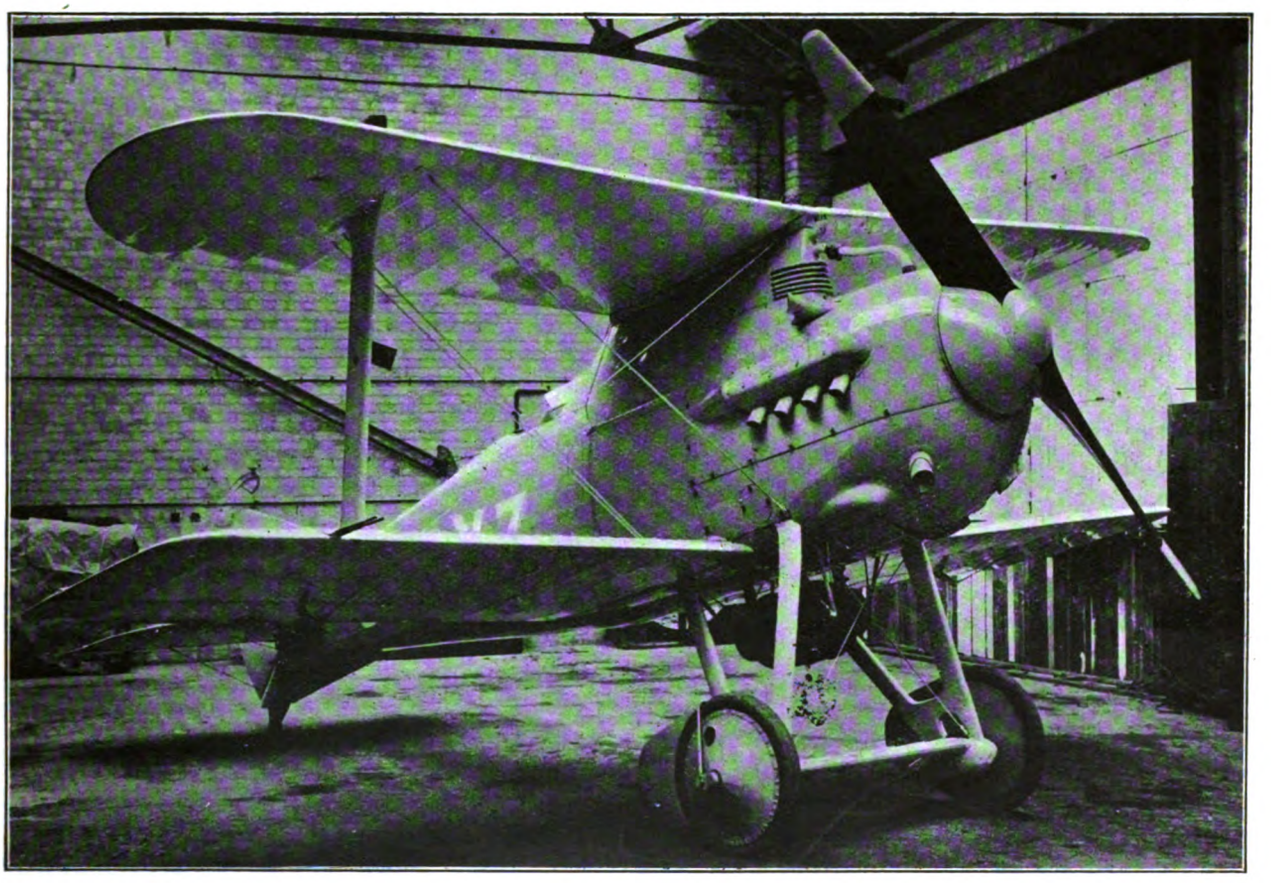
The main particulars of the "Mars I" are given hereafter.

Specification of the "Mars I."

Span	**23 ft. (7.01 m.).**
Chord	**4 ft. 9 in. (1.45 m.).**
Gap	**4 ft. 9 in. (1.45 m.).**
Stagger	**1 ft. 1¼ in. (0.31 m.).**
Total wing area	**205 sq. ft. (19 m.²)**
Length overall	**21 ft. (6.4 m.).**
Engine type and h.p.	**450 h.p. Napier.**



The "Mars I" in its 1923 form when it was known as the "Gloster."



The Gloucestershire "Mars I" (450 Napier "Lion") in the 1922 state with a single Lamblin radiator.

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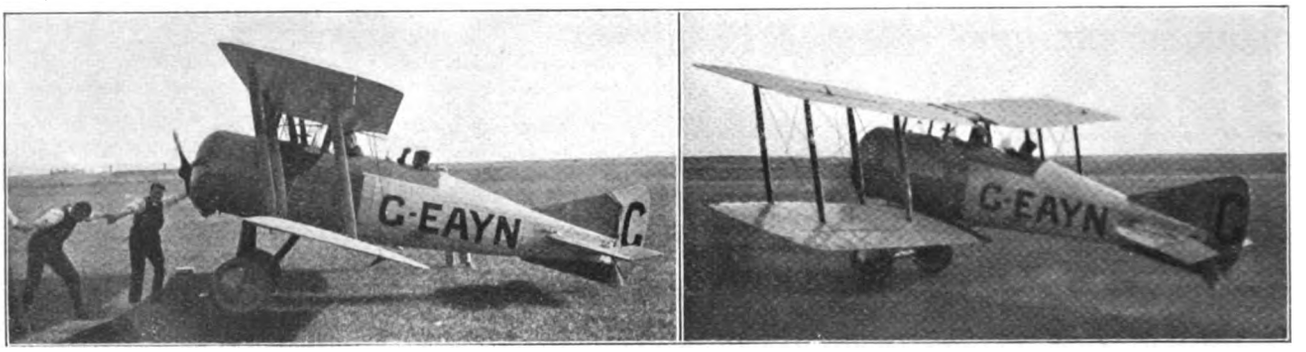
GLOUCESTERSHIRE—*continued.*



The Gloucestershire Aviation Co's "Mars II" or "Sparrowhawk" with 230 h.p. B.R. engine.

Fuel capacity	**50 galls. (227 l.)**
Oil capacity	**5 galls. (23 l.).**
Water capacity	**7 galls. 30 l.).**
Weight empty	**1,890 lbs. (approx.) (860 kg.).**
Weight loaded	**2,500 lbs. (1,134 kg.).**
Loading per sq. ft.	**12.2 lbs. (59.6 km./m².)**
Weight per h.p.	**5.5 lbs. (2.5 kg.)**

Since the Mars I was first produced it has been modified to some appreciable extent in order to increase the maximum speed for racing purposes.

The body has been cleaned up by a process of fairing over minor excrescences and new wings of very considerably reduced span and of modified section have been fitted. In this condition the machine won the 1922 Aerial Derby at an average speed of nearly 180 m.p.h.

For the 1922 Deutsch Cup race, a further reduction of wing surface was made. The machine failed to complete the course, owing to the pilot losing his way, but subsequently under official observation in France the machine in an attempt on the world's speed record slightly improved on the existing record by making an average of 341,243 kms. pr. hr. (212 m.p.h.) over four runs on the kilometre course.

As this speed did not beat the previous record by the statutory 4 kms. pr. hr., it failed to pass as a record.

In 1923 the "Bamel," modified in detail and rechristened the "Gloster," won the Aerial Derby at a speed of 192 m.p.h. over the 200 mile course.

THE SPARROWHAWK OR MARS II.

The machine shown in the photograph above is a two-seater fighter produced by the Gloucestershire Aircraft Company to Mr. Folland's design. The machine is a very slight modification of Mr. Folland's very successful "Nighthawk," and is of the same main dimensions. It is fitted with a 230 h.p. B.R.II rotary engine, and makes an exceedingly useful light two-seater for general military purposes. A number of this type have been supplied to the Japanese Navy and have proved exceedingly successful machines both for advanced training and for routine duties.

THE "MARS IV."

This is practically a "Mars II" fitted with hydrovanes and emergency flotation gear. The engine is the B.R.II.

The Gloucestershire "Mars X" Single-seater for shipboard use (B.R.II engine, 230 h.p.).

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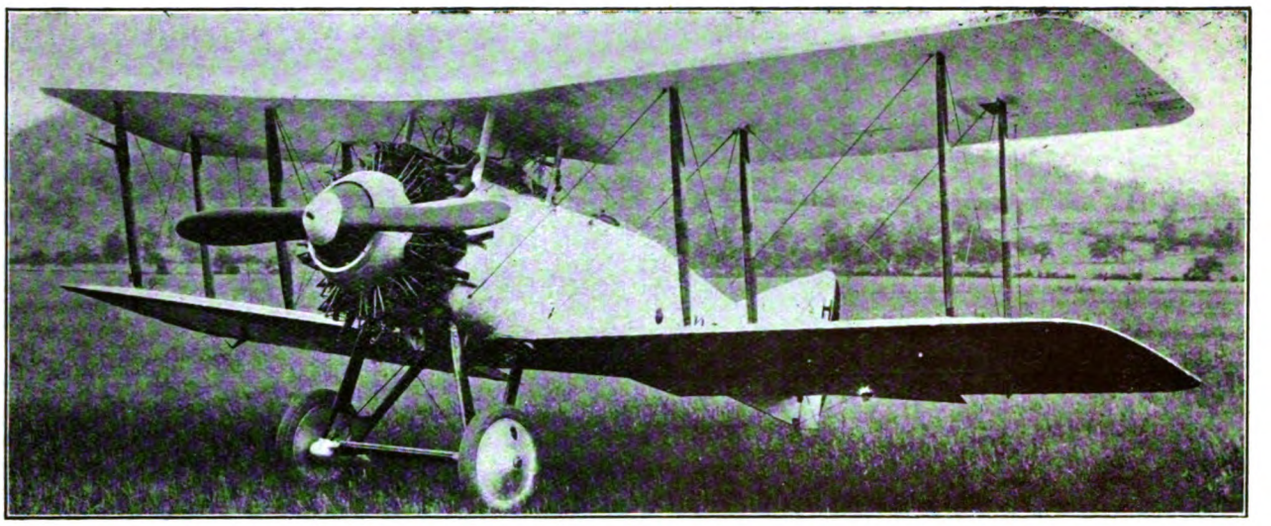
GLOUCESTERSHIRE—*continued.*



The Gloucestershire "Mars VI" Fighter (Armstrong Siddeley "Jaguar" engine, 370 h.p.)

THE MARS VI.

A high performance single-seat fighter of the normal biplane type, possessed of a very wide speed range and a high degree of manœuvrability.

This machine is fitted with quickly detachable petrol tanks and an undercarriage mounted on universal joints so arranged as to be rapidly removed and replaced,

Specification.

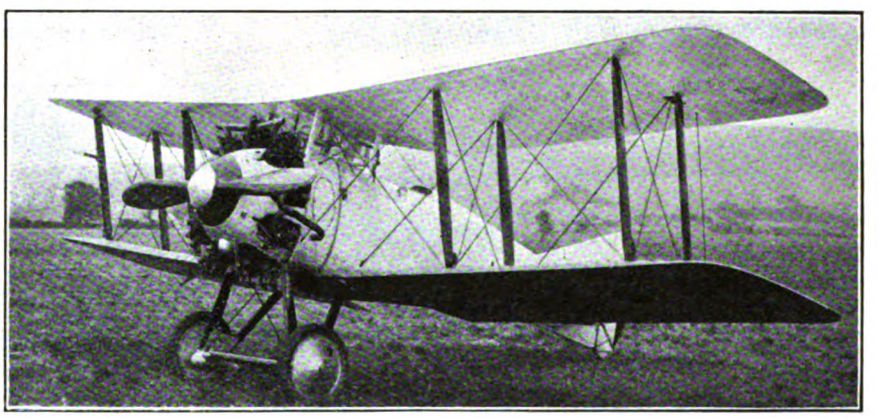
Span	28 ft. (8.55 m.).
Chord	5 ft. 3 in. (1.6 m.).
Gap	4 ft. 6 in. (1.37 m.).
Area of wings	270 sq. ft. (25 sq. m.).
Length	18 ft. approx. (5.5 m.).
Height	9 ft. approx. (2.75 m.).
Weight loaded	2,375 lbs. (1,078 kgs.).
Engine	Siddeley "Jaguar," 370 h.p.
Wing loading	8.8 lbs./sq. ft. (43.5 kgs./sq. m.).
Weight per h.p.	7.0 lbs. (3 18 kgs.).
Max. speed	150 m.p.h. (242 k.p.h.).
Speed at 10,000 ft. (3,050 m.).	142 m.p.h. (229 k.p.h.).
Climb to 20,000 ft. (6,100 m.)	18 mins.

THE MARS X.

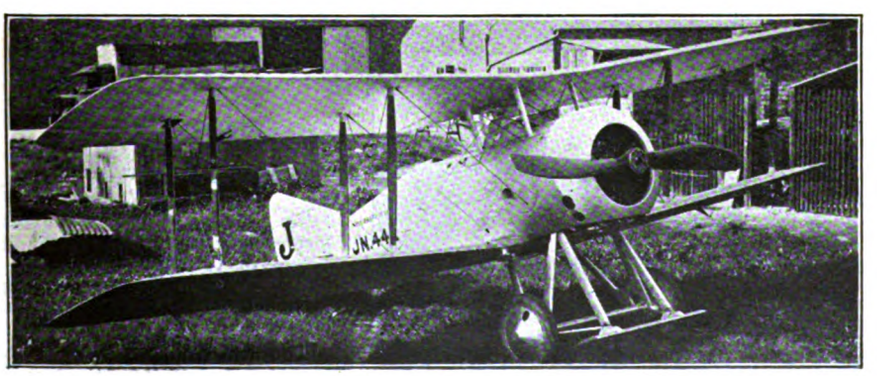
This is a machine of generally similar design to the "Mars VI," but arranged for ship-board use. It is equipped with an engine of lower power, but is in most essentials identical with the "Mars VI."

Specification.

Span	28 ft. (8.55 m.).
Chord	5 ft. 3 in. (1.6 m.).
Gap	4 ft. 6 in. (1.37 m.).
Area of wings	270 sq. ft. (25 sq. m.).
Length	18 ft. approx. (5.5 m.).
Height	9 ft. approx. (2.75 m.).
Weight loaded	2,165 lbs. (985 kgs.).
Engine	B.R.II, 230 h.p.
Wing loading	8.3 lbs./sq. ft. (39.4 kgs./m^2.).
Weight per h.p.	9.8 lbs. (4.45 kgs.).
Speed, max.	120 m.p.h. (194 km.h.).
Speed at 10,000 ft. (3,050 m.)	110 m.p.h. (177 km.h.).
Climb to 15,000 ft. (4,575 m.)	20 mins.



The Gloucestershire "Mars VI" Single-seater Fighter with a 400 h.p. Bristol "Jupiter" engine.



A Gloucestershire "Mars IV" Ship-board Fighter supplied to the Imperial Japanese Navy (230 h.p. B.R.II.)

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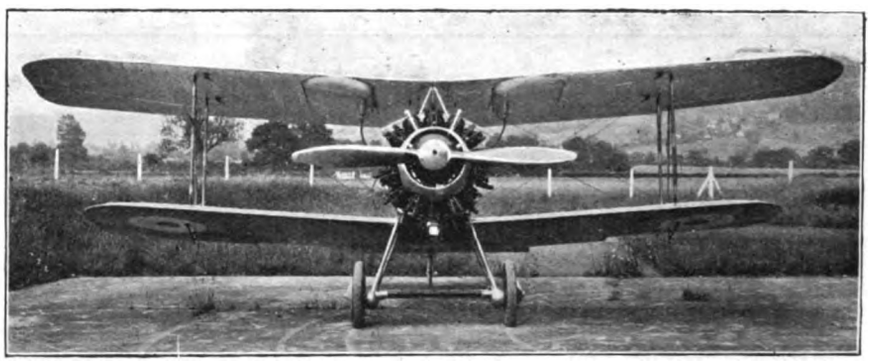
GLOUCESTERSHIRE—
continued.

THE "GREBE."

A new single-seat fighter produced during the past year. It differs from the "Mars VI" mainly in the wing arrangement, the fuselage, tail and undercarriage being very similar to the earlier type.

The wings consist of a thick section upper wing and a thinner section bottom wing of somewhat reduced span and chord, instead of the equal upper and lower R.A.F.15 wings of the "Mars VI." In addition, there is only one row of interplane struts per side in the "Grebe." The upper wings are in two pieces, attached to a cabane above the fuselage, there being no centre section. Gravity fuel tanks are built into the upper wing, one on each side of the machine, forming noticeable bulges in the under surface of the wing.

The machine is fitted with the Armstrong-Siddeley "Jaguar" engine of 350 h.p., and with this engine the machine has a notably good performance at high altitudes.



The Gloucestershire "Grebe" (Armstrong-Siddeley "Jaguar" 350 h.p.)

Specification.

Span (top)	29 ft. 4 in. (8.97 m.).
Chord (top)	5 ft. 3 in. (1.6 m.).
Chord (bottom)	5 ft. (1.52 m.).
Wing area (top)	144 sq. ft. (13.2 sq. m.).
Wing area (bottom)	110 sq. ft. (10.2 sq. m.).
Total area	254 sq .ft. (23.5 sq . m.).
Weight loaded	2,570 lbs. (1,170 kgs.).
Engine	"Jaguar" 350 h.p.
Wing loading	10.1 lbs./sq. ft. (49.7 kgs./sq. m.).
Power loading	7.35 lbs./h.p. (3.34 kgs./ h.p.).
Petrol capacity	52 galls. (236 litres).
Useful load	445 lbs. (202 kgs.).
Speed, sea level	150 m.p.h. (242 km.h.).
Speed at 10,000 ft. (3,050 m.)	142 m.p.h. (230 km.h.).
Climb to 20,000 ft. (6,100 m.)	24 mins.

THE "GROUSE."

A machine of generally similar form to the "Grebe," designed for advanced trained and fitted with a "B.R.II" engine of 230 h.p.

The span of the top plane is slightly less than that of the "Grebe," whereas both span and chord of the lower wing are distinctly less in the "Grouse." Otherwise the machines are extremely similar.

Specification.

Span (top)	28 ft. (8.35 m.).
Chord (top)	5 ft. 3 in. (1.6 m.).
Chord (bottom)	4 ft. (1.22 m.).
Wing area (top)	137 sq. ft. (12.7 sq. m.).
Wing area (bottom)	78 sq. ft. (7.2 sq. m.).
Total area	215 sq. ft. (19.9 sq. m.).
Weight loaded.	2,106 lbs. (955 kgs.).
Engine	"B.R.II," 230 h.p.
Wing loading .	10.3 lbs./sq. ft. (50.3 kgs./sq. m.).
Power loading.	9.2 lbs./h.p. (4.2 kgs./ h.p.)
Petrol capacity	40 galls. (182 litres).
Useful load	400 lbs. (181 kgs.).
Speed, sea level	128 m.p.h. (206 km.h.).
Speed at 10,000 ft. (3,080 m.)	118 m.p.h. (190 km.h.).
Climb to 10,000 ft. (3,050 m.)	11 mins.

The Gloucestershire "Grouse" (230 h.p. B.R.II. engine).

GOSPORT.

The Gosport Aircraft Co., Ltd., Gosport, Hants.

The Gosport Aircraft Company was formed early in the War by Sir Charles Allom, of White, Allom & Co., Ltd., and Mr. Charles Nicholson, of Camper & Nicholson, the famous yacht builders, of Gosport.

The firm is not actively engaged in the Aircraft Industry at present.

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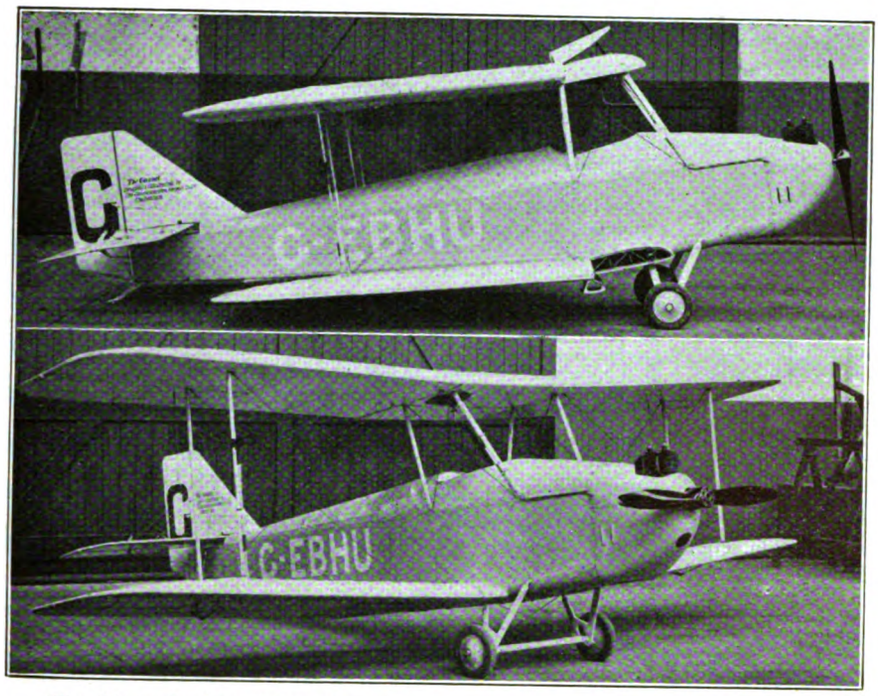
GLOUCESTERSHIRE—*continued.*



The Gloucestershire "Gannet."

THE "GANNET."

A miniature tractor biplane with folding wings, built for the Light Aeroplane competition at Lympne, 1923. It was fitted with an untried two-stroke engine of 750 c.c., which could not be persuaded to function for more than a few minutes, and consequently the machine did not give visible evidence of its flying qualities.

Specification.

Span	**18 ft. (5.5 m.).**
Length	**16 ft. 8 in. (5.1 m.).**
Height	**5 ft. 9 in. (1.75 m.).**
Chord	**3 ft. 1½ in. (.95 m.).**
Wing area	**103 sq. ft. (9.85 sq. m.).**
Weight light	**283 lbs. (128 kgs.).**
Weight loaded	**460 lbs. (209 kgs.).**
Wing loading	**4.46 lbs./sq. ft. (21.2 kgs./sq. m.).**

This machine has since been fitted with the 745 c c. Blackburne engine.

GNOSSPELIUS.

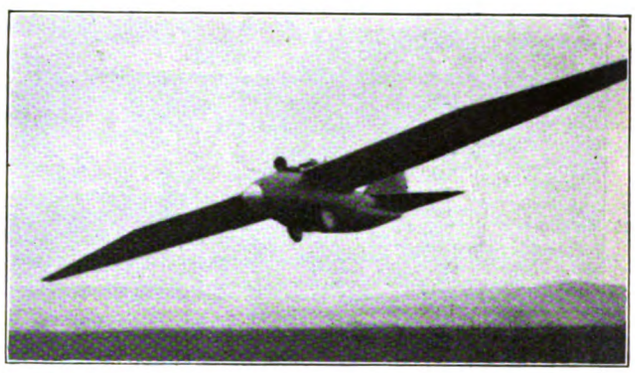
THE GNOSSPELIUS "GULL."

Designed by Major O. T. Gnosspelius as the result of a large number of model experiments and built under his supervision at Short Bros. works at Rochester, the "Gull" was one of the first light aeroplanes to fly in Britain, and is in many respects one of the most interesting machines of the type yet built in any country.

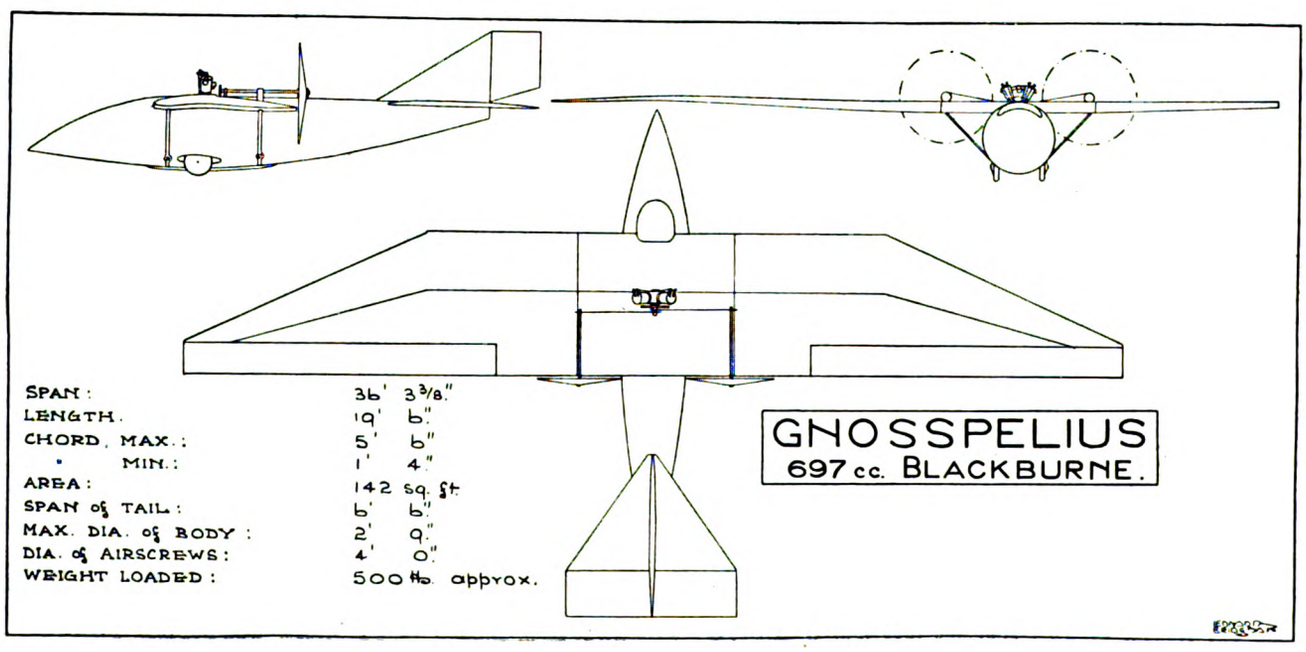
The machine is of distinctly bird-like form, having a circular section fuselage with a sharp down-turned nose, and wings which have a short parallel section, after which the leading edge slopes back to very nearly a point at the wing tip.

The wings are of a thin section and are built on four spars. A centre section of about 7 ft. span is braced by steel tube struts on the front and rear of the four spars, and carries centrally, between the two inner spars, a Blackburn V twin engine of 698 c.c. Two pusher airscrews are carried by shafts supported above the bracing struts and are chain-driven from the engine. The outer sections of the wing are entirely unbraced. A curious feature of the wing is the fact that a "step" is fitted on the top surface at about one-third of the chord from the leading edge.

The fuselage is boat-built of very thin spruce planks carried on light elm hoops. The axle is carried within this body, and the wheels half project through the bottom.



The Gnosspelius "Gull" (697 c.c. Blackburne).



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H

HANDASYDE.

The Handasyde Aircraft Co., Ltd., 11a, Regent Street, London, S.W.

Formed during 1921, this company was founded by Mr. G. H. Handasyde and Mr. Hamilton Fulton, for the purpose of undertaking the design and manufacture of aircraft of all types.

Mr. Handasyde, as the technical member of the "Martinsyde" firm from its inception until its recent financial misfortunes, has a world-wide reputation as a designer and aeronautical engineer.

THE HANDASYDE TYPE H.2 MONOPLANE.

This machine was built specifically for passenger and mail service in Australia.

The machine is to a very large extent a purely timber structure. Very little metal work is used, and the few metal fittings are of a simple and robust character.

The Fuselage.

The fuselage appears to be of the normal three-ply covered type, but is really of the braced longeron and strut type, the bracing being performed by the plywood skin. The "struts" are in the form of hoops, which also act as formers.

This fuselage is built in two parts, the forward one an engine-carrying nose, and the after part, which contains cabin, etc., and carries the tail.

The front frame of the fuselage consists of four spruce members, with three-ply cornerpieces. There is an intermediate set of four spruce struts and thereafter follows the hoop structure of the cabin.

These hoops are of box section. The inner member of each box is a bent hoop made of ash in two plies. The outer members are of spruce, and the sides of the box are formed by three-ply. The hoops are glued and screwed together.

The after "hoop" at the cabin end has the three-ply sides of the box extended inwards, and a door-frame worked into the structure, thus partitioning the cabin from a mail compartment which is immediately aft of it.

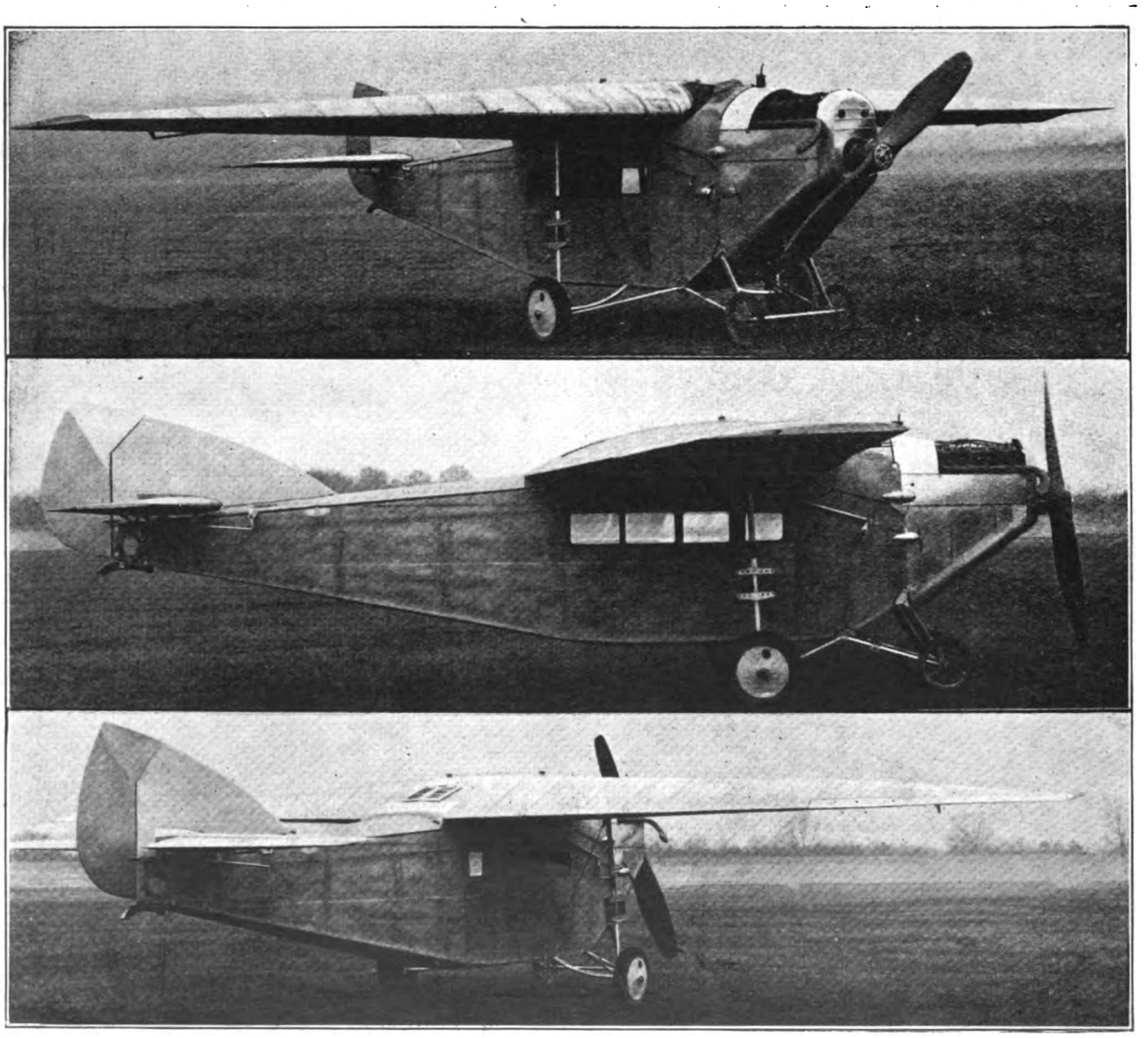
Aft of the cabin, the struts are of spruce only, but are of the same type as the cabin hoops.

Over and above the four main longerons there are numerous stringers of spruce from the front of the cabin to the tail. They are let into the outer spruce members of the hoops. The skin of three-ply is screwed to all frames, longerons and stringers.

The engine-carrying nose consists of two ash members on each side, which meet at a forward cross member of five-ply spruce. The engine bearer tubes run from this member to the bulkhead in front of the pilot. This nose does not form a detachable engine-mounting, because the after support for the engine bearer is part of the main fuselage structure. It is however removable after taking out engine and bearers, and this simplifies packing the machine for transport.

Wing Structure.

The machine is of the cantilever monoplane type, with the wing entirely above the fuselage. They are of the multi-spar type, with a wooden covering, and apart from the joints between



The Handasyde H2 Monoplane (360 h.p. Rolls-Royce "Eagle" engine).

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HANDASYDE—*continued.*

Mr. Raynham's Handasyde Light Aeroplane.

the wings and the body, the two halves of the wings, and the aileron hinges and control mechanism, the only metal parts employed are screws.

The wings are heavily tapered, both in plan and in section, from root to tip. The leading edge sweeps back slightly, the trailing-edge pronouncedly forward. The section is biconvex. The four spars, which are spaced at approximately equal intervals across the chord, are all of " H " section built up, with top and bottom flanges of spruce in two halves, and a web of spruce two-ply, covered with glued-on fabric. The flanges are glued and screwed to the webs.

The ribs are of three-ply built in sections which fit into the recesses in the spars, stiffened with spruce members glued and screwed to them. The outer edges of the rib webs are notched between spars, and through-going spruce longerons are run through the notches. There are two of these stringers between each spar. Over the stringers is applied a set of continuous spruce laths, which form the rib flanges proper. The covering is of three-ply strip, laid on parallel to and flush with the rib flanges, and screwed to stringers and spars.

The wings are built in two sections, which join on the centre line of the machine.

The wings rest on the top rail of the fuselage over the cabin, An aluminium block is fitted beneath each spar, and this block carries at its outer end a downward projection which registers on the outside of a mating block of the same material on the longeron. This block on the longeron is fitted with two upwardly projecting tongues, one of which registers on each side of the block on the spars. Therefore when each set of these blocks is properly engaged, the wing is accurately located both laterally and longitudinally in reference to the fuselage.

The lift load from the spar is taken to the fuselage structure through one right and left-hand screw adjuster—generally of the nature of the ordinary wire strainer, which is coupled at the top to a strap surrounding the spar and at its bottom to a lug attached to one of the main fuselage frames.

THE HANDASYDE LIGHT AEROPLANE.

Built for Mr. Raynham to fly in the 1923 Light Aeroplane competitions, this machine is of very simple and straightforward construction.

The fuselage is of the three-ply covered type, with the wing mounted on the upper surface. This wing is of the normal two-spar type, but with three-ply covering back to the rear spar. The section is thick and highly cambered at the roots, tapering considerably to the tips. The front spar is braced by a pair of steel tube struts, extending to about 5 ft. out from the side of the fuselage, and the rear spar by a streamline wire.

The pilot is seated behind the wing, and the engine—a 750 c.c. " Douglas "—is mounted above the fuselage, just ahead of the wing. The airscrew is direct-driven. A pair of short plank struts project below the fuselage, and to them is sprung the undercarriage axle.

The tail plane is of the partly balanced and entirely movable type. The rudder is also balanced and no fin is fitted.

Specification.

Span	**30 ft. (9.15 m.).**
Length	**19 ft. 2 in. (5.81 m.).**
Chord	**5 ft. (1.52 m.).**
Wing area	**135 sq. ft. (12.5 sq. m.).**

DE HAVILLAND.

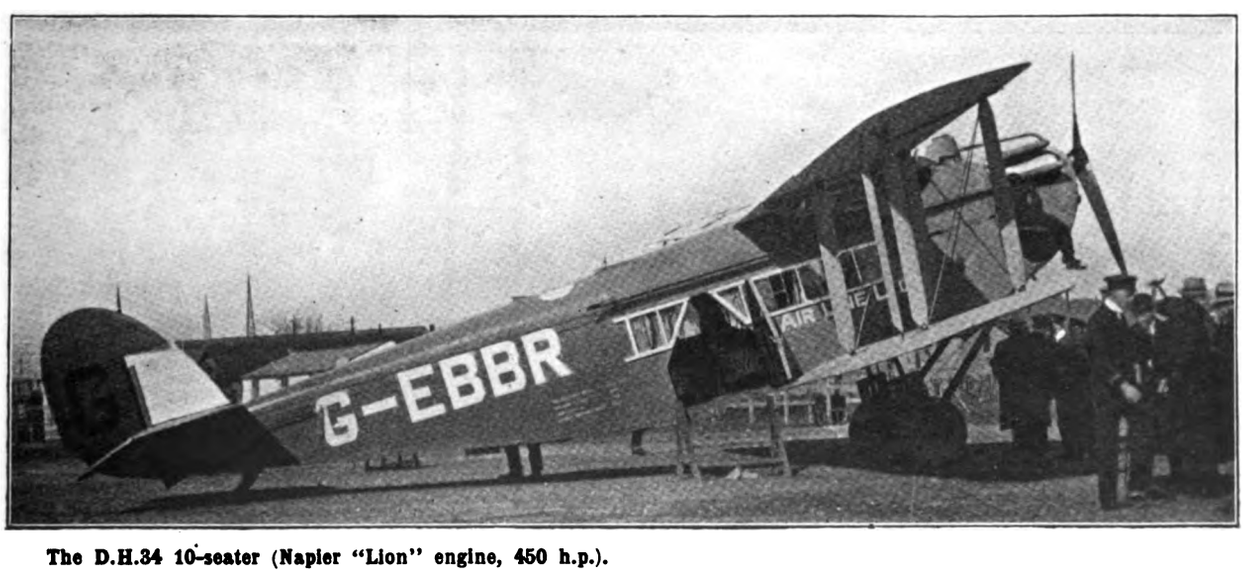
The De Havilland Aircraft Co., Ltd., Stag Lane, Edgware, Middlesex.

There can be few names which are associated with so long a series of really successful aircraft as that of Capt. G. de Havilland. Starting on his active career as a designer with the Royal Aircraft Factory at Farnborough, in the very dark ages of aeroplane design, his capacity was recognised before the War by Mr. Holt Thomas, who secured his services as designer to the Aircraft Manufacturing Co.

At a very early date in the War de Havilland aircraft produced by this firm became famous for their excellent all-round qualities, both of performance and of construction. This reputation was enhanced by each succeeding product bearing this name. There is probably no other single designer in the world who has produced so many different types of aircraft which were actually produced in quantity and used in quantity over the front.

It should here suffice to enumerate the D.H.1, the D.H.2 and 4, the D.H.5, the D.H.9 and 9a and the D.H.10 as among the actual service machines, and the well-known D.H.6, so largely used for elementary training.

With the coming of peace D.H. machines were speedily converted to more civilised uses. Even before peace D.Hs were



The D.H.34 10-seater (Napier "Lion" engine, 450 h.p.).

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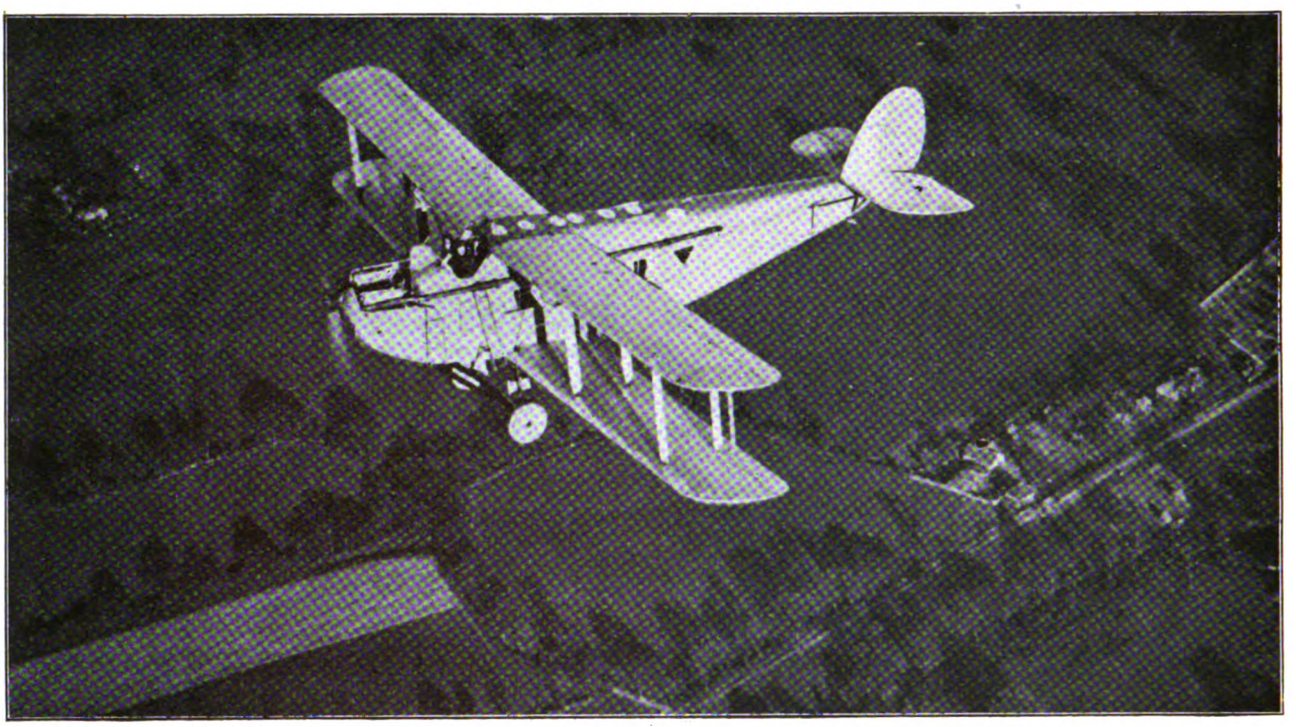
DE HAVILLAND—*continued.*



A D.H.34 photographed from another machine during a test flight.

used to convey the most eminent politicians to Paris in connection with the Peace Negotiations, and at the earliest possible moment the Air Transport and Travel Co. began a regular passenger service using similar machines.

These converted war-time D.H.4s sufficed to show that the operation of such a regular service was entirely feasible, and Capt. de Havilland, on the basis of this experience, devoted his energy to the production of aircraft designed specifically for such purposes. As a result there were produced the D.H.16 and later the D.H.18.

The Aircraft Manufacturing Co., however, ceased its operations and for a time there seemed to be serious risk of a cessation of Capt. de Havilland's activities. Fortunately this did not occur and early in 1920 the de Havilland Aircraft Co. was formed, thanks to Mr. Holt Thomas, and Capt. de Havilland's work continues uninterrupted.

D.H. COMMERCIAL TYPES.

THE D.H.34.

The D.H.34 was designed as the result of three years of continuous experience with earlier types of D.H. machines on the London-Paris service. Since its introduction into actual commercial operation, early in 1922, it has shown itself to possess in a very high degree the desirable attributes which were aimed at in its design. It has shown itself to be abnormally reliable and safe and it is fairly generally admitted by passengers of experience to be the most comfortable passenger carrying machine in regular commercial service.

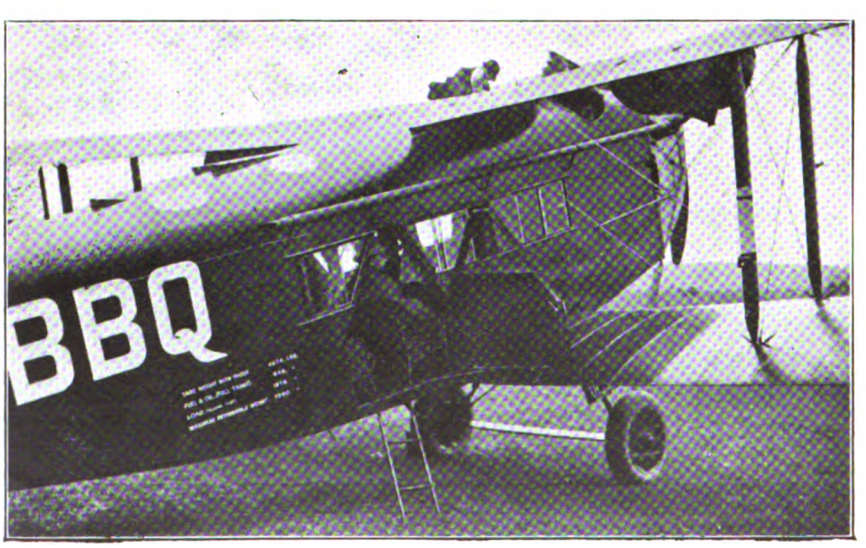
In general arrangement it follows the design of the earlier D.H.18—the most important differences are that the pilot's seat has been removed from behind to ahead of the cabin and that the machine carries nine passengers instead of the seven of the earlier type.

The fuselage is of rectangular section, built on four longerons and three ply covered. The fore end is the usual fireproof bulkhead. The engine installation is carried on a separate removable structure ahead of this. Immediately aft of the bulkhead is the pilot's cockpit—seating two side by side—pilot and one other or two pilots, as may be desired.

The cabin follows. This has ample headroom and is both ventilated and warmed. It contains seats for nine passengers and there is at the rear the necessary lavatory. Entrance is by side door. Behind again is a baggage compartment with an entirely separate entrance. A folding ladder, carried on the machine, allows easy access to the cabin door.

The wing structure is of standard biplane type, the top wing being applied to the top of the cabin structure, the bottom one springing from the lower edge thereof.

The undercarriage is of the Vee type, with rubber shock absorbers and an oleo dashpot gear contained in the rear telescopic legs of the Vees. The undercarriage is arranged to allow the wings to present a very large angle of incidence when the



The Cabin, etc. of the D.H.34 Passenger Carrier.

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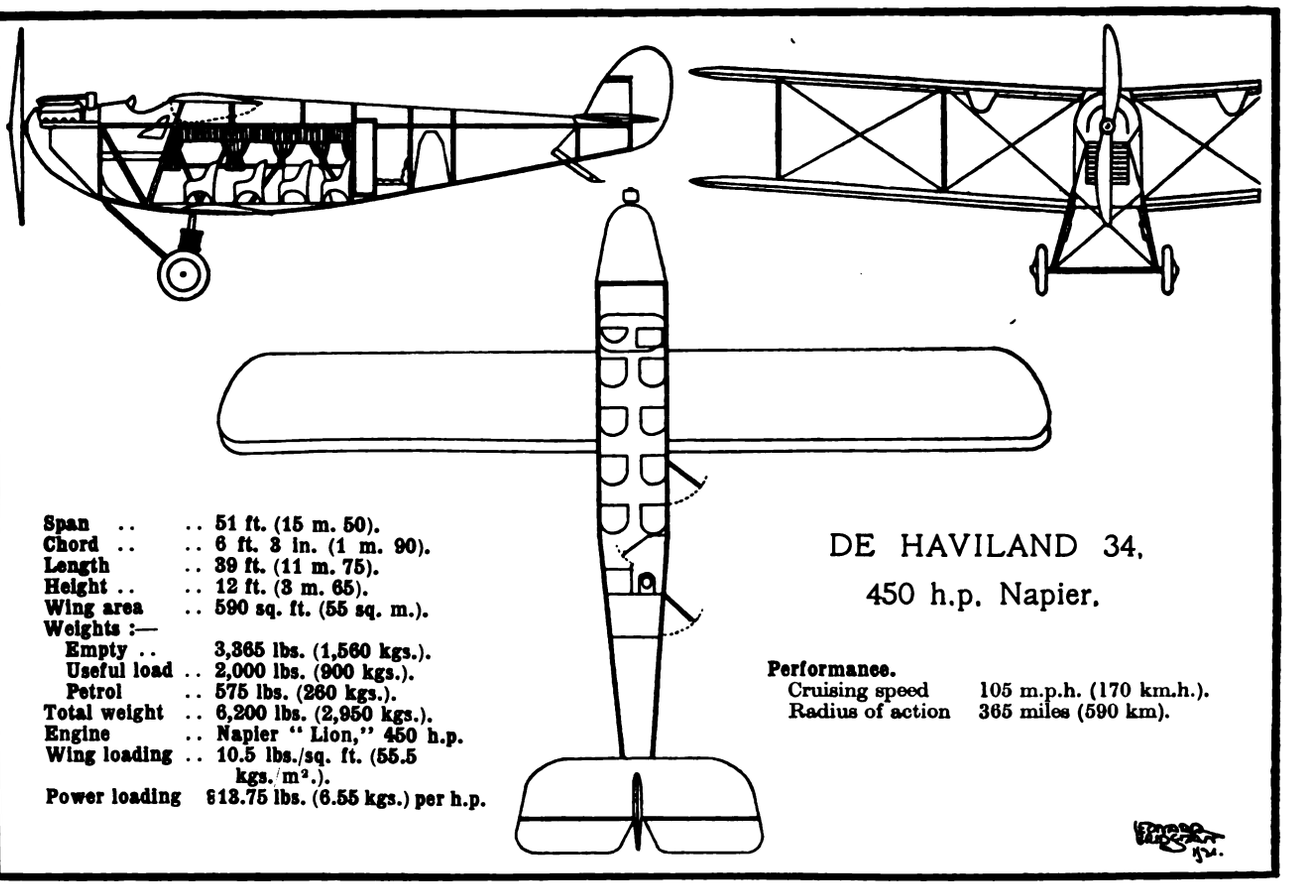
DE HAVILLAND—*continued.*



Span	**51 ft. (15 m. 50).**
Chord	**6 ft. 3 in. (1 m. 90).**
Length	**39 ft. (11 m. 75).**
Height	**12 ft. (3 m. 65).**
Wing area	**590 sq. ft. (55 sq. m.).**
Weights :—	
Empty	**3,365 lbs. (1,560 kgs.).**
Useful load	**2,000 lbs. (900 kgs.).**
Petrol	**575 lbs. (260 kgs.).**
Total weight	**6,200 lbs. (2,950 kgs.).**
Engine	**Napier " Lion," 450 h.p.**
Wing loading	**10.5 lbs./sq. ft. (55.5 kgs./m².).**
Power loading	**813.75 lbs. (6.55 kgs.) per h.p.**

DE HAVILAND 34,
450 h.p. Napier.

Performance.

Cruising speed	105 m.p.h. (170 km.h.).
Radius of action	365 miles (590 km).

machine is at rest on the ground. This makes for a very rapid " pull up " on landing.

Ailerons—operated through the D.H. differential gear—are fitted to all wings.

The tail unit is of normal design. An adjustable incidence of the tail plane allows the machine to be trimmed for a wide range of load distribution.

The engine—a Napier " Lion "—together with radiator, oil tanks and all accessories, except fuel, is carried by the separate engine-mounting already mentioned. The whole power unit is thus easily removable for overhaul and test, and interchangeable units may be kept in store—so that the machine need not be out of commission more than an hour or so to change engines.

Petrol is carried in two tanks suspended on the under side of the upper wings. No petrol is present inside the body. There is very little risk of the main body of petrol catching fire even in a crash, and a purely gravity feed is secured.

Long exhaust pipes are fitted to the engine, and thanks to this, and to the sound-deadening qualities of the fuselage, passengers are subject to very little noise.

A modified D.H.34, with wings of somewhat greater surface than those of the original type was completed early in 1924 and is under test at the time of going to press.

THE D.H.37.

The machine is a three-seater tractor biplane, fitted with a Rolls-Royce " Falcon " engine, and embodies the result of the designer's unexampled experience of the design of economical aircraft applied to the problem of providing a long-distance high-speed machine, suitable either for the needs of the owner-pilot, or for light commercial work.

The first machine was built for Mr. A. S. Butler, a director of the DeH. firm, whose experience as an owner-pilot is responsible for many of the features of the design.

The Fuselage.

The fuselage is built on spruce longerons and struts, covered throughout with three-ply and entirely free from wire bracing, except in the bottom bays under the engine. The engine-mounting arrangements present no striking novelties, the steel tube bearers of the engine are carried on brackets from the side members of the fuselage, which in turn are braced to the bottom cross members by steel tubes.

Immediately behind the engine the usual fireproof bulkhead is fitted. The bay following this bulkhead is available either for leg room for the forward passenger—or if his seat is removed—for extra petrol tanks or for luggage stowage. This bay comes below the upper wing centre section, and is followed by a somewhat longer bay which serves as the front cockpit. This cockpit is large enough to contain two seats in tandem. The pilot's cockpit is immediately behind this, and behind that again the top fairing of the fuselage is hinged to allow the insertion of luggage into the succeeding bay. Beyond this luggage space the fuselage tapers away to a vertical knife edge at the stern.

Wings.

The wing structure is of the single bay type, with wings of equal span, fairly heavily staggered. The upper centre section is carried on a pair of slightly splayed-out N struts, and contains

The D.H.37 (270 h.p. " Falcon " Rolls-Royce engine).

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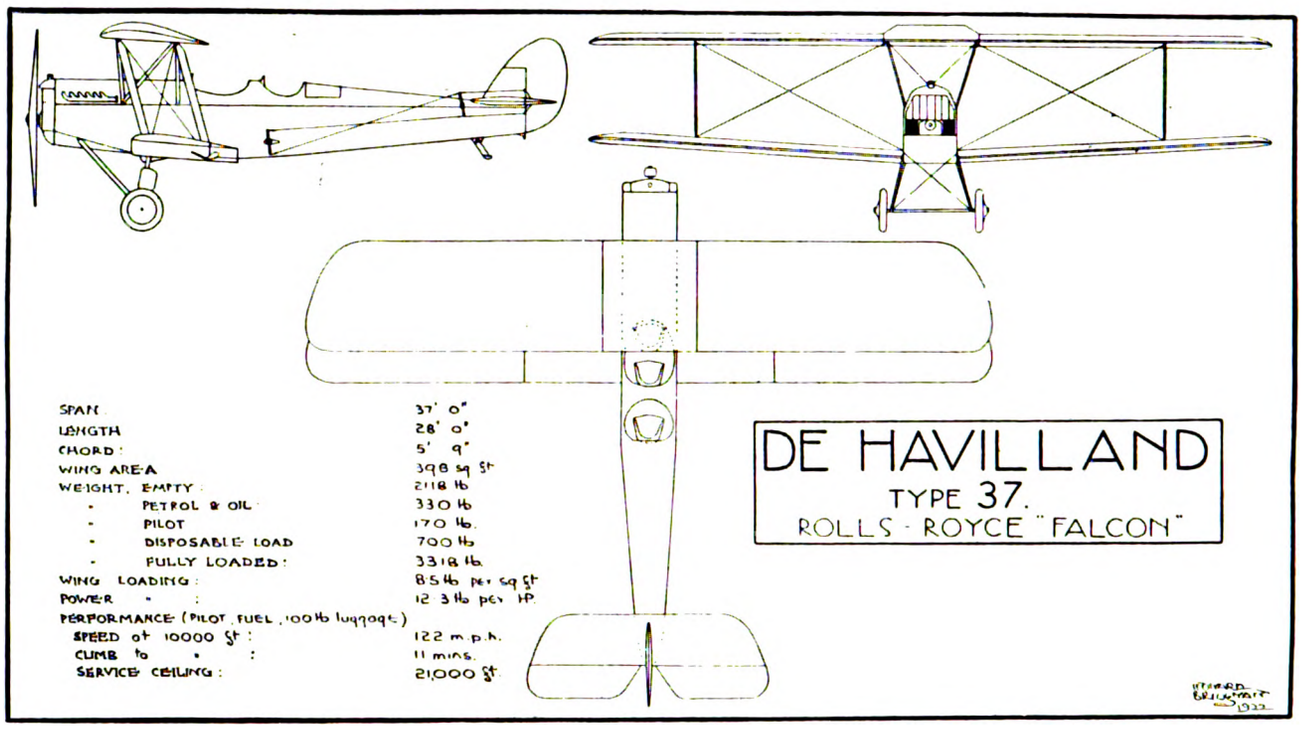
DE HAVILLAND—*continued.*


DE HAVILLAND
TYPE 37.
ROLLS-ROYCE "FALCON"
SPAN 37' 0"
LENGTH 28' 0"
CHORD 5' 9"
WING AREA 398 sq ft
WEIGHT, EMPTY 2118 lb
" PETROL & OIL 330 lb
" PILOT 170 lb.
" DISPOSABLE LOAD 700 lb
" FULLY LOADED 3318 lb.
WING LOADING 8.5 lb per sq ft
POWER " 12.3 lb per HP
PERFORMANCE (PILOT, FUEL, 100 lb luggage)
SPEED at 10000 ft 122 m.p.h.
CLIMB to " 11 mins.
SERVICE CEILING 21,000 ft.

a large gravity petrol tank. The lower wings attach directly to the body, and have an appreciable dihedral angle. The upper wings have no dihedral. Ailerons are fitted to the lower wing only.

Undercarriage.

The undercarriage consists of two vees, each with one combined rubber and oleo-pneumatic shock absorber. The front member of each vee is hinged to the fuselage below the engine. The rear member is telescopic, with rubbers carried on external brackets projecting fore and aft, and contain the oil and air chamber within. The axle is fixed to the vees.

A rubber-sprung ash tail skid, fitted with very solid removable shoes, completes the landing gear.

Power Plant.

The engine installation is simple and straightforward. Two large oil tanks are fitted below the engine bearer tubes, one on each side of the sump. Petrol is gravity fed to the carburetters from the centre-section tank. Extra tanks can be fitted in the front cockpit when necessary, and petrol is then pump fed to the gravity tank.

The radiator, of the usual honeycomb type, straddles the reduction gear of the engine. The header tank and the side frames of the radiator are formed to the lines of the engine cowling, thus greatly simplifying the shape of the removable portions of that always troublesome feature. The engine is fitted with long exhaust pipes which pass right back to behind the third seat.

The variable load, whether passengers or goods, is placed near the centre of gravity, no ballast is required whatever load is carried within the usual limits.

Weights and Performance of the D.H.37.

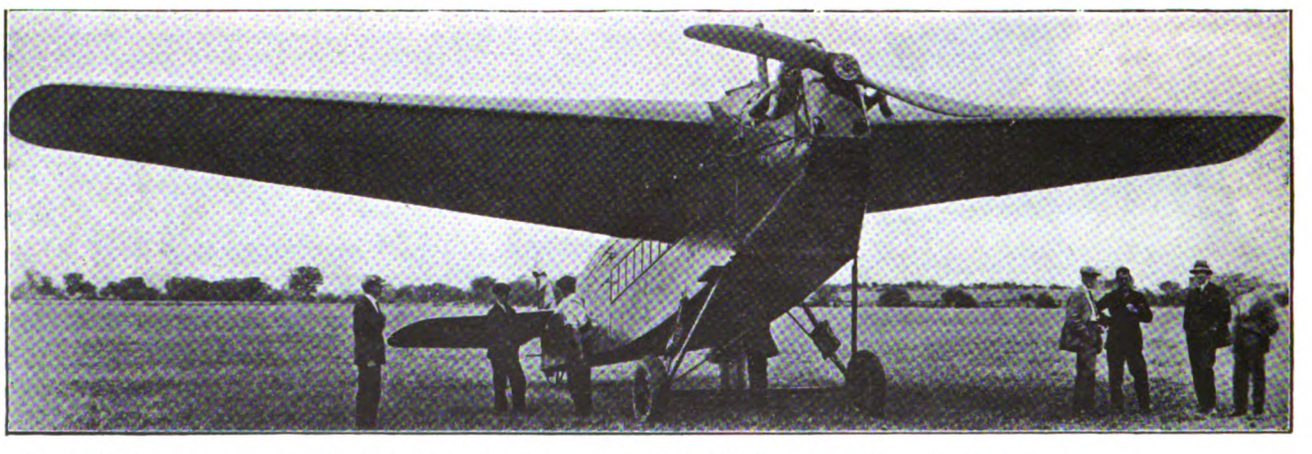
Weight loaded :—3,400 lbs. (1,545 kgs.).
Useful load :—With 40 galls. petrol and 3 galls. oil, 475 lbs. (213 kgs.).
With 80 galls. petrol and 6 galls. oil, 150 lbs. (68 kgs.).
Range (40 galls. petrol) :—5½ hours.
Maximum speed :—125 m.p.h. (200 km.h.).
Cruising speed :—105 m.p.h. (170 km h.).

THE D.H.29 COMMERCIAL MONOPLANE.

The D.H.29 is a twelve-seater Napier-engined cantilever monoplane, which has been built for the Department of Research, the Air Ministry.

The most noteworthy feature is, naturally enough, the wing structure. Cantilever monoplanes are not complete novelties, even in this country, but the D.H.29 was the first British example of the type of any large size.

The machine, as originally built, gave remarkably promising results on trial, but very naturally proved to require some detailed modifications and alterations and it would be misleading to describe the original version as an existing type. A photograph which shows the main features of the original machine is, however, reproduced.



The D.H.29 ten-seater monoplane (450 h.p. Napier engine). Officially known as the "Doncaster."

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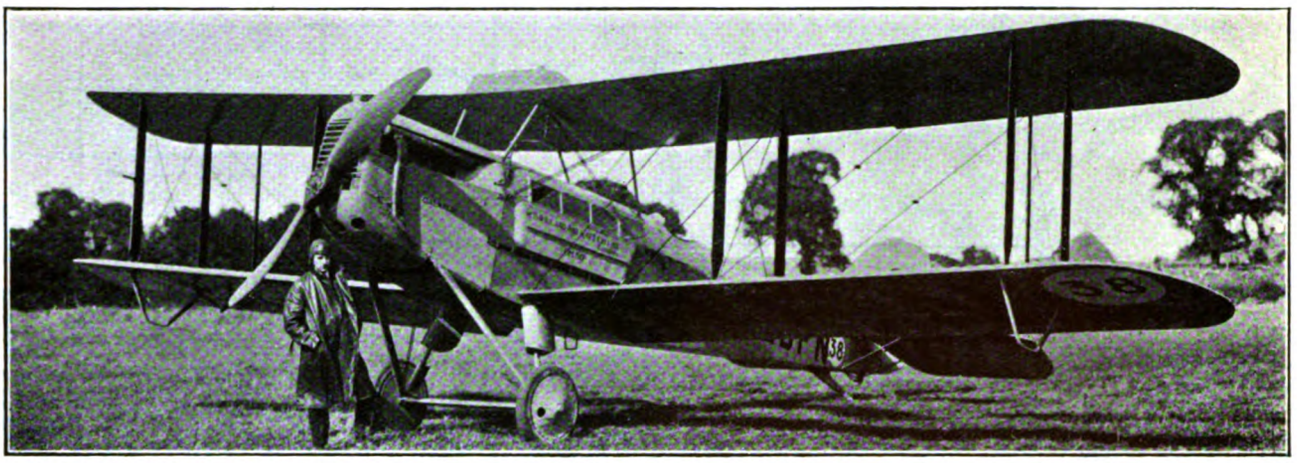
DE HAVILLAND—*continued.*



A D.H.50 (230 Siddeley "Puma").

THE "D.H.50."

The "D.H.50" is a machine which has been designed in the light of experience with the de Havilland Hire Service, and now replaces the well-known "D.H.9c," which has hitherto been used thereon. The machine carries four passengers in two sets of side-by-side seats carried in an enclosed cabin under the centre section of the wing. The pilot is seated in an open cockpit behind this cabin. The engine is the Siddeley "Puma" of 240 h.p., which has always been used with such satisfactory results on the "D.H.9c."

The engine is fitted with long exhaust pipes, which form a most effective silencer, and the same attention to the comfort of the passenger will be found in this machine as in the "D.H.34." The passenger seats may be removed and the cabin space can thus be used for the storage of freight. A load of from 900 to 1,000 lbs. may be carried.

Despite the considerably increased load carried on this machine the performance of the "D.H.50" is equal to that of the "D.H.9," and the range of flight will be 300 miles.

THE "D.H.50a."

The "D.H.50a" represents a slight modification of the original type in matters of detail. The cabin has been slightly lengthened. A new form of rib is used in the wings, the centre section struts are slightly more splayed and the undercarriage modified to move the wheels slightly further forward.

The type "50a" will be the standard type used on the de Havilland Hire Service, the new Manchester-Belfast service, and has been adopted by the Swedish Post Office for the line Mälmo-Hamburg.

"D.H.50a's" will be used on some of the Australian regular lines, and the type is being manufactured under license in Belgium.

It is proposed to manufacture a float undercarriage for this type of machine, as it is held that the type so equipped will have great possibilities in undeveloped countries where rivers and lakes form the most easily utilized "landing" grounds.

Specification.

Span	**42 ft. 9 in. (13 m.).**
Length	**29 ft. 9 in. (9.08 m.).**
Wing area	**437 sq. ft. (41 sq. m.).**
Weight loaded	**3,900 lbs. (1,770 kgs.).**
Useful (paying) load	**982 lbs. (446 kgs.).**
Engine	**230 h.p. Siddeley "Puma."**
Wing loading	**8.95 lbs./sq. ft. (43 kgs./sq. m.).**
Power loading	**16.9 lbs./h.p. (7.7 kgs./h.p.).**
Speed at 3,000 ft. (915 m.)	**112 m.p.h. (181 km.h.).**
Landing speed	**38 m.p.h. (61 km.h.).**
Climb to 5,000 ft. (1,525 m.)	**9 mins. 48 secs.**
Absolute ceiling	**17,300 ft. (5,280 m.).**
Range at 100 m.p.h. (161 km.h.)	**375 miles (600 km.).**

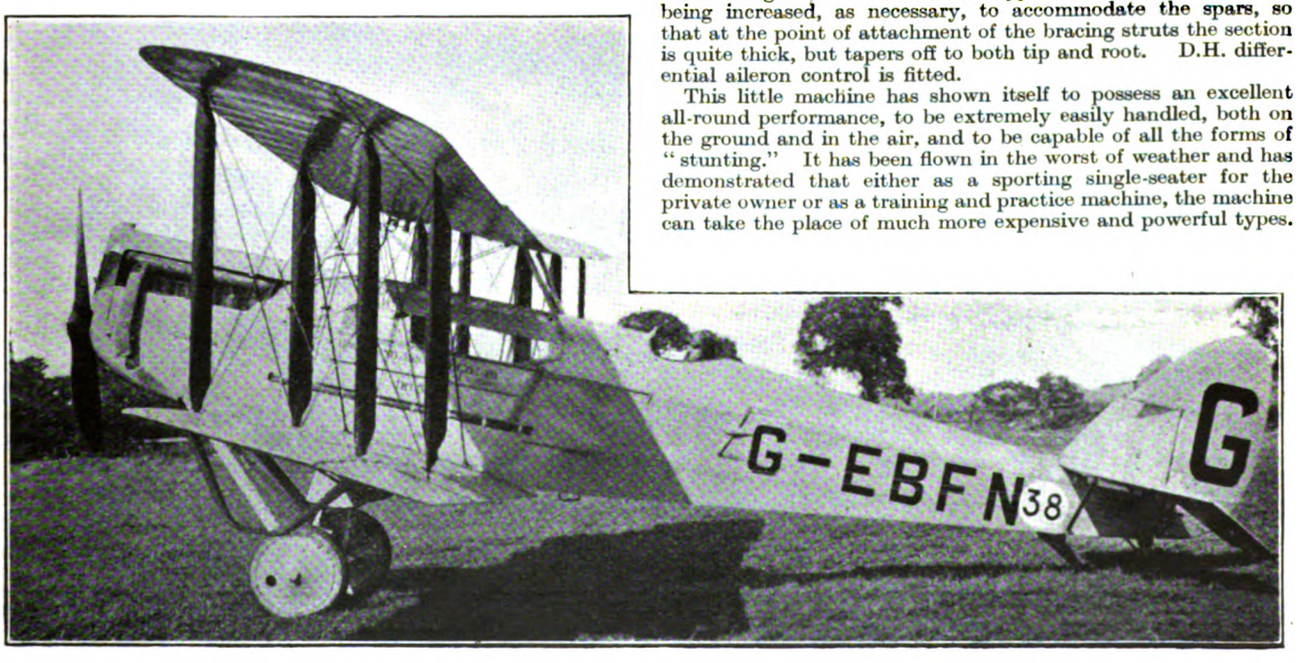
THE "D.H.53."

One of the most successful and useful of the many light aeroplanes which have yet been produced. The machine is of the low-wing monoplane type, with rigid bracing struts running from the top of the fuselage to about one-third of the half span on each side.

A normal V undercarriage of the de Havilland type, with telescopic rear strut, is fitted. The fuselage is three-ply covered and the tail is of conventional type.

The wings are of "R.A.F.15" type of section, the ordinates being increased, as necessary, to accommodate the spars, so that at the point of attachment of the bracing struts the section is quite thick, but tapers off to both tip and root. D.H. differential aileron control is fitted.

This little machine has shown itself to possess an excellent all-round performance, to be extremely easily handled, both on the ground and in the air, and to be capable of all the forms of "stunting." It has been flown in the worst of weather and has demonstrated that either as a sporting single-seater for the private owner or as a training and practice machine, the machine can take the place of much more expensive and powerful types.



A "D.H.50" showing the passenger cabin.

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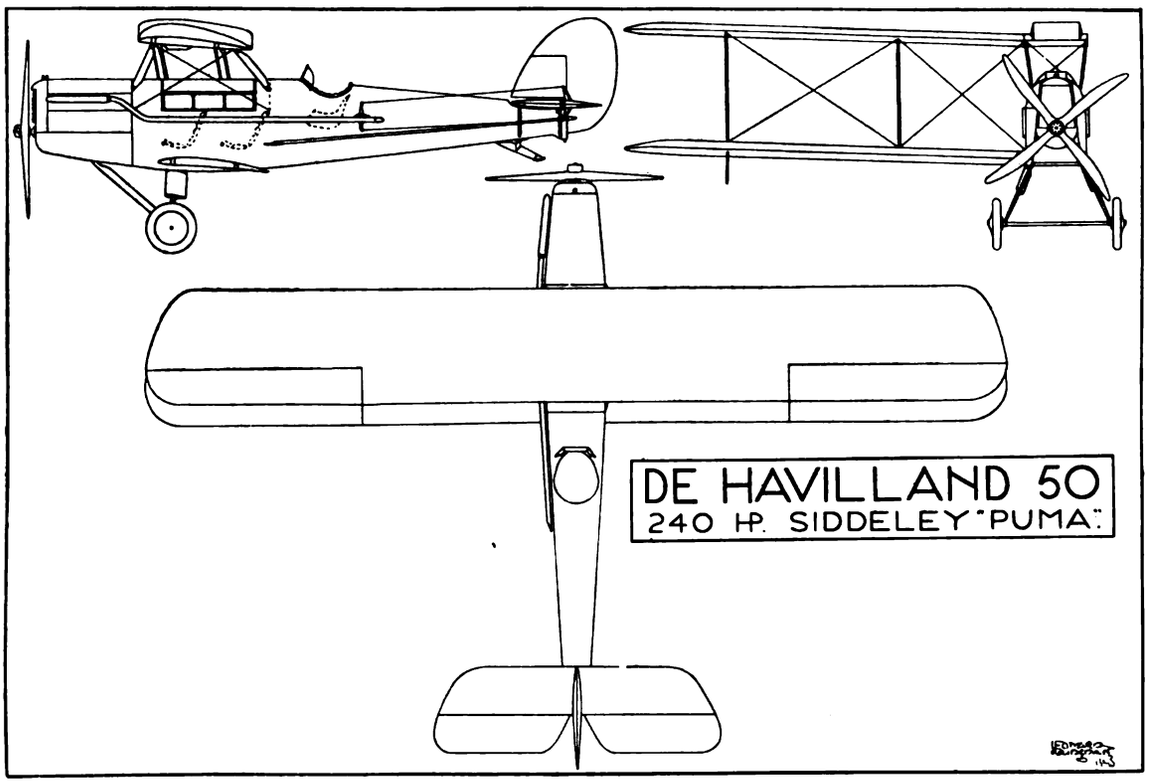
DE HAVILLAND—*continued.*



The engine is a 698 c.c. Blackburne 2-cylinder motor-cycle type, with overhead valves, which is extremely simple and cheap to maintain and overhaul.

Machines of this type have been ordered by the Royal Air Force for training purposes.

Specification.

Span	**30 ft. 1 in.**
Length	**19 ft. 8 in.**
Wing area	**120 sq. ft.**
Weight empty	**326 lbs.**
Weight loaded	**490 lbs.**
Wing loading	**4 lbs./sq. ft.**
Max. speed	**73 m.p.h. (117 km.h.).**
Landing speed	**33 m.p.h. (53 km.h.).**
Climb to 10,000 ft. (3,050 m.)	**45 mins.**
Ceiling	**15,000 ft. (4,570 m.).**
Fuel capacity	**2 galls. (9.1 litres).**
Radius at 60 m.p.h. (96.5 km.h.)	**150 miles (240 km.).**

D.H. MILITARY AIRCRAFT.

Of the war-time types of De Havilland, the D.H. 9A. and the D.H.9 are still used, the former in the British Royal Air Force and both types in a number of foreign services.

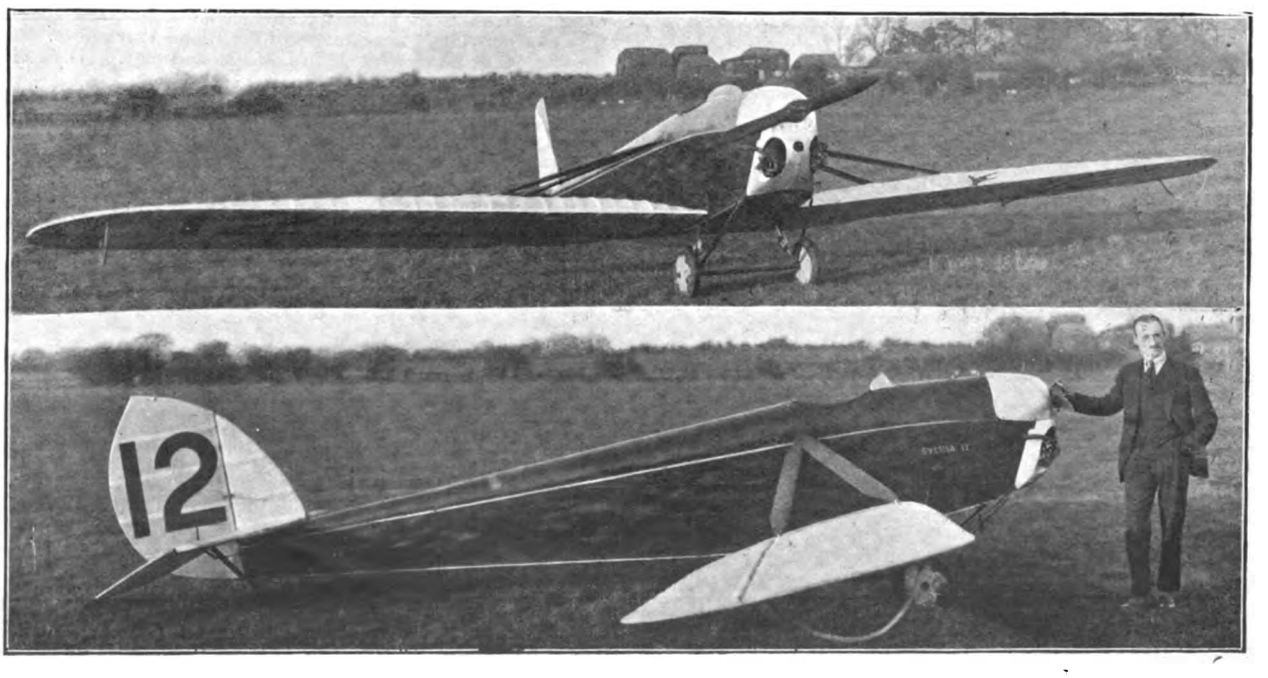
A new version of the D.H.9 for military purposes has recently been designed and is described hereafter. In addition the firm have produced a number of types, some of which are at present indescribable.

THE "D.H.9."

The well-known D.H.9 has during the past year made an appearance equipped with the Siddeley "Jaguar" engine in place of the original Siddeley "Puma." With the lighter and more powerful air-cooled engine the machine's all-round performance is considerably augmented.

The machine is eminently suitable for a wide range of military duties, including reconnaissance, photography, light bombing and fighting.

It should be noted that some 500 lbs. of extra load over and above that specified hereafter may safely be carried—with a natural slight decrease in the performance.



The "D.H.53" Light Aeroplane (698 c.c. Blackburne engine).

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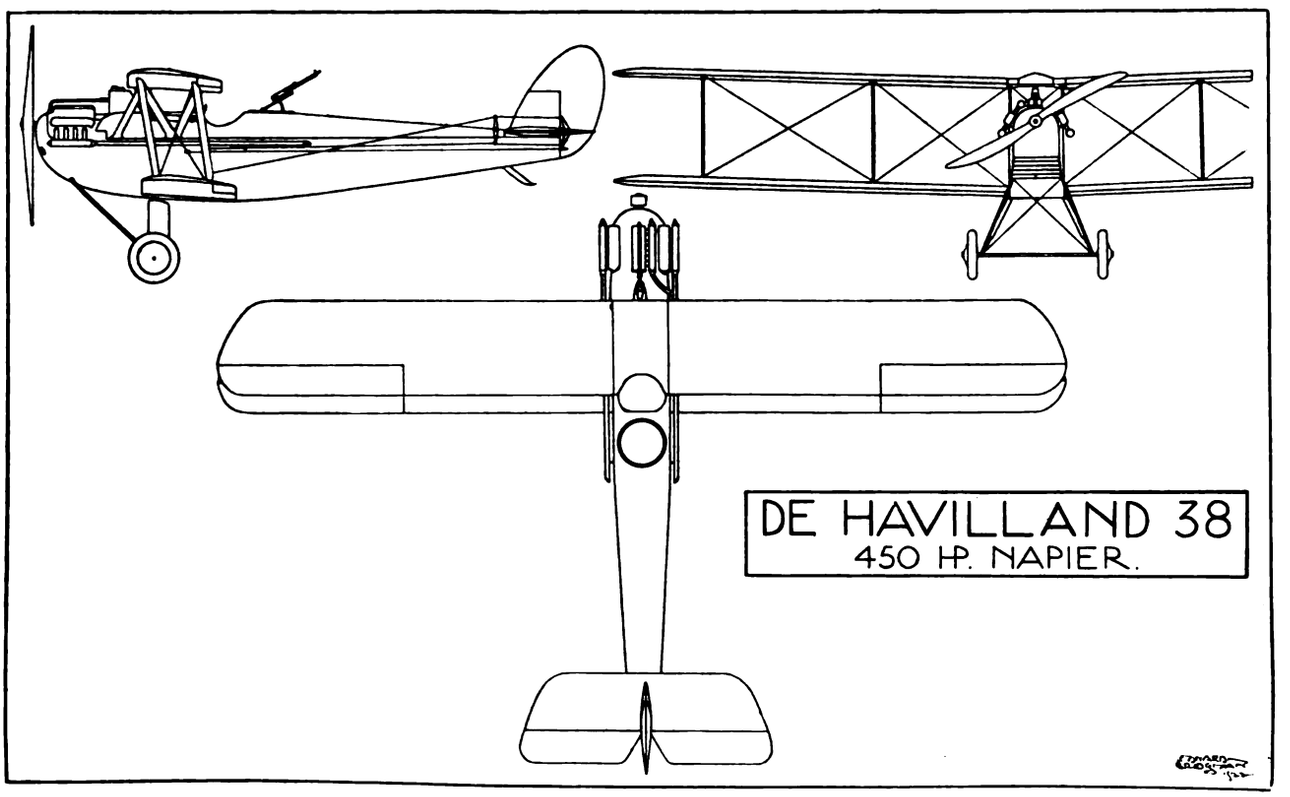
DE HAVILLAND—*continued.*



Performance of the D.H.9 with Siddeley "Jaguar" engine (350 h.p.).

Weight empty	**2,200 lbs. (1,000 kgs.).**
Fuel and oil	**550 lbs. (250 kgs.).**
Crew and military load	**548 lbs. (247 kgs.).**
Weight loaded	**3,295 lbs. (1,497 kgs.).**
Speed at 10,000 ft. (3,050 m.)	135 m.p.h. (218 km.h.).
Climb.	
To 10,000 ft. (3,050 m.)	9 mins.
Ceiling	25,000 ft. (7,600 m.).
Range at 10,000 ft. (3,050 m.)	390 miles (630 kgs.).

THE D.H.38.

This is an entirely new type of machine designed on the basis of long accumulated experience intended to serve for various military duties. It is available for long-range bombing, short-range bombing with greatly-increased bomb loads, general reconnaissance, photography and so forth. It has a fuselage of ample size, permitting the storage of such fittings as cameras, parachutes or oxygen apparatus. Small or medium-sized bombs may be carried under the pilot's seat, large bombs are carried under the lower wings. The pilot is provided with a bomb-sight aperture through the fuselage of a range from 45° forward to vertically downwards.

The general arrangement of the D.H.38 is shown in a drawing reproduced. The table which follows indicates the performance under different conditions of loading, and gives a measure of the wide range of usefulness of this machine.

Performance of the D.H.38 with 450 h.p. Napier "Lion."

(1) Equipped as Short Range Heavy Bomber.

Military load	**2,870 lbs. (1,300 kgs.).**
Speed (10,000 ft. (3,050 m.)	**113 m.p.h. (182 km.h.).**
Climb to 10,000 ft. (3,050 m.)	**22 mins.**
Ceiling	**13,000 ft. (3,960 m.).**
Range	**370 miles (600 km.).**

(2) Equipped as Short Range Reconnaissance Machine.

Load (pilot, observer, guns, etc.)	**660 lbs. (300 kgs.).**
Speed at 10,000 ft. (3,050 m.)	**125 m.p.h. (200 km.h.).**
Climb to 10,000 ft. (3,050 m.)	**10 mins.**
Ceiling	**24,800 ft. (7,500 m.).**
Range	**370 miles (600 km.).**

(3) Equipped as Long Range Reconnaissance Machine.

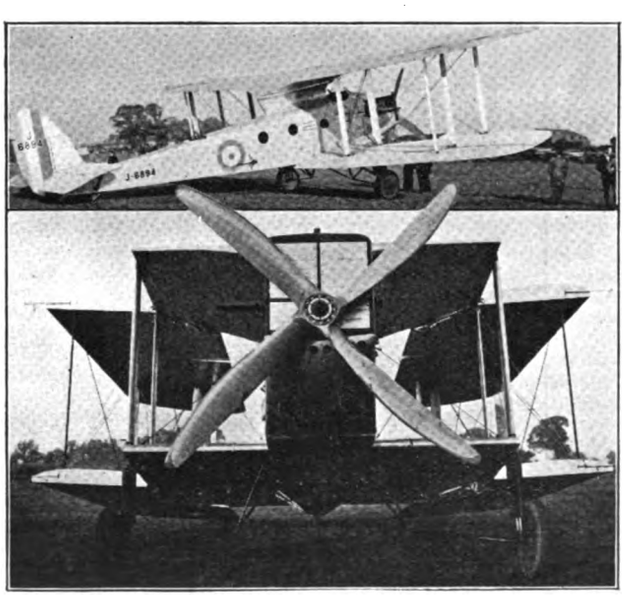
Load (pilot, observer and armament)	**660 lbs. (300 kgs.).**
Climb to 10,000 ft. (3,050 m.)	**22 mins.**
Speed at 10,000 ft. (3,050 m.)	**113 m.p.h. (182 km.h.).**
Ceiling	**13,000 ft. (3,960 m.).**
Range	**1,000 miles (1,550 km.).**

THE D.H.27.

This machine, which is shown in photographs on this and the next page, is a heavy long-range bomber designed for the Air Ministry. It is not yet permissible to give any details of either dimensions or performance.

It is fitted with the Rolls-Royce "Condor" engine of 650 h.p.

Generally, the machine will be seen to follow standard D.H. practice in design—the only noteworthy features being the curious centre section, which is carried by a large streamlined erection from the fuselage, and the fact that folding wings are fitted.



The D.H.27 "Derby" Bomber (650 h.p. Rolls Royce "Condor" engine).

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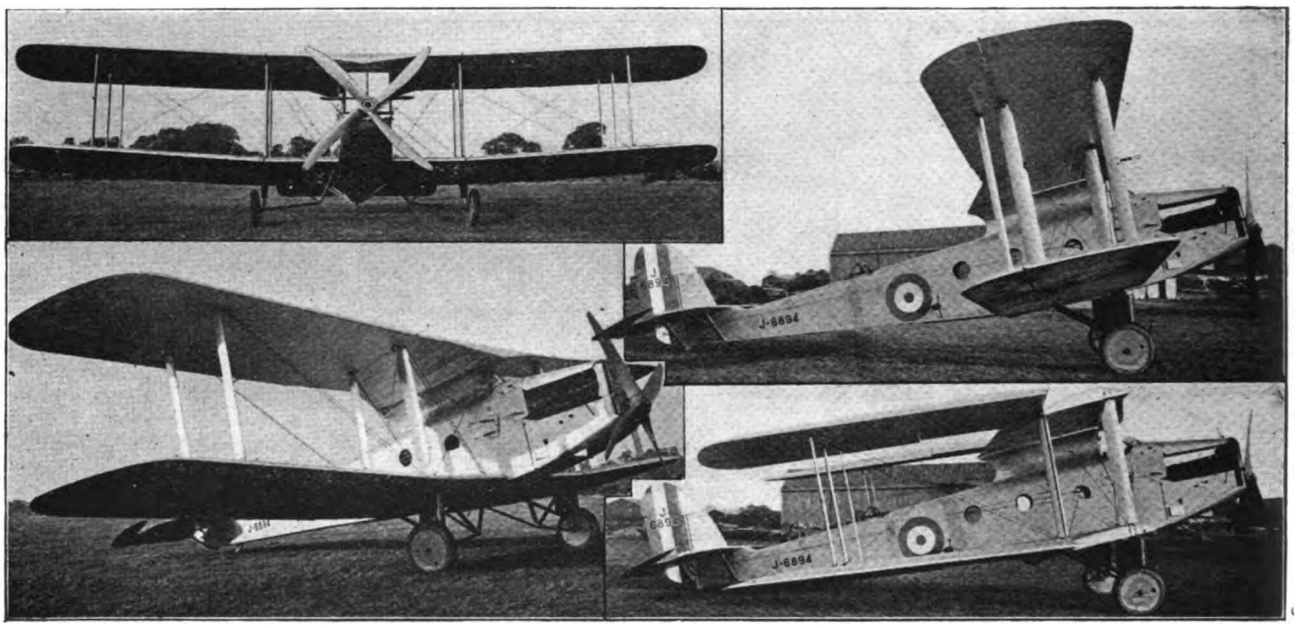
DE HAVILLAND—*continued.*



Four views of the D.H.27 "Derby" Bomber (650 h.p. Rolls-Royce "Condor" engine).

THE "D.H.49."

This machine, which is to be regarded as an improved version of the older "D.H.9a," is designed to serve the same general purposes as that machine, and will doubtless take its place in the future. The general arrangement of the machine is similar to the original, but many important improvements in detail have been incorporated in the design. Amongst these of the greatest importance are the use of an undercarriage equipped with an oleo shock absorber combined with rubber in compression, the use of the new de Havilland Differential Aileron Control, the omission of all bracing wires from the tail unit, and the use of ball bearings throughout the control gears. The engine is the Rolls-Royce "Eagle IX" developing 370 h.p. at 1,800 r.p.m. Very great attention has been given in the design of this machine to a most perfect controllability, particularly at low speed.

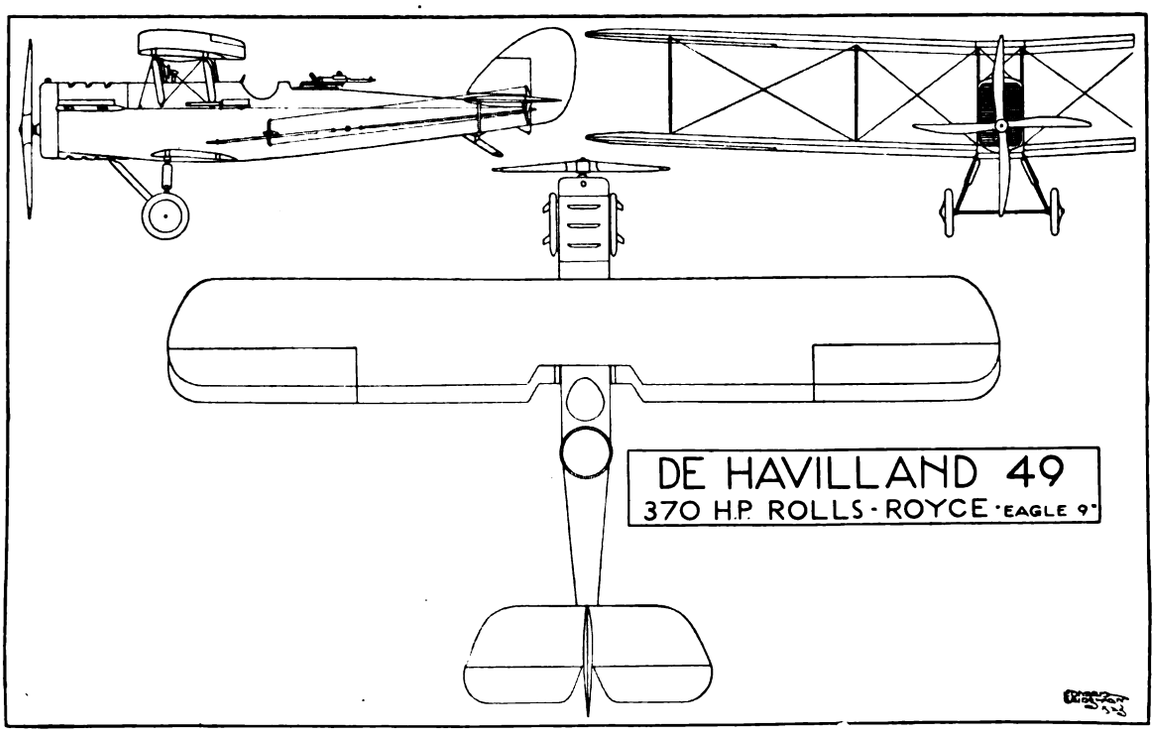
Performance of the "D.H.49" with Rolls-Royce "Eagle IX."

(1) As reconnaissance machine with 3½ hours' fuel.

Lead (excluding crew and fuel)	308 lbs. (139 kgs.).
Total weight	4,200 lbs. (1,900 kgs.).
Speed, sea level	134 m.p.h. (215 km.h.).
Speed at 10,000 ft. (3,050 m.)	127 m.p.h. (204 km.h.).
Climb to 10,000 ft. (3,050 m.)	12 mins.
"Take off"	130 yds. (119 m.).

(2) As Bomber.

Weight empty (with water)	2,900 lbs. (1,313 kgs.).
Fuel and oil (4¾ hours)	900 lbs. (407 kgs.).
Military load	1,340 lbs. (607 kgs.).
Total weight	5,500 lbs. (2,490 kgs.).
Speed, sea level	115 m.p.h. (185 km.h.).
Speed at 10,000 ft. (3,050 m.)	102 m.p.h. (164 km.h.).
Climb to 10,000 ft. (3,050 m.)	30 mins.
"Take off" run	200 yds. (183 m.).



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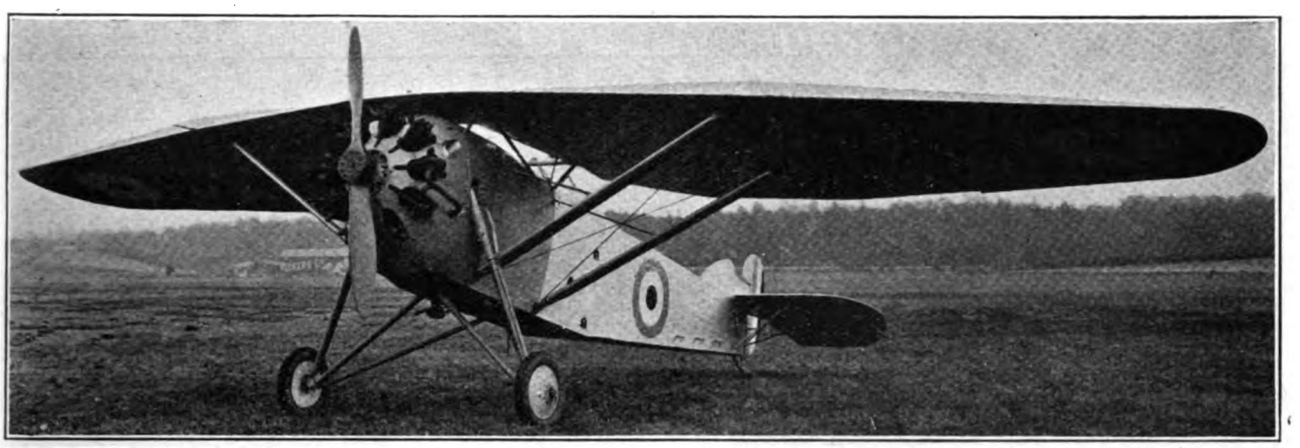
HAWKER.



The Hawker "Duiker" (400 h.p. Bristol "Jupiter" engine).

The Hawker Engineering Co., Ltd., Kingston-on-Thames.

This firm, founded after the liquidation of the Sopwith Co. for the manufacture of motor cycles and the like, was formed by the late Mr. H. G. Hawker, with the support of Mr. T. O. M. Sopwith, Mr. F. Sigrist and others who were concerned in the original Sopwith venture.

The firm is now engaged on aircraft work, having orders from the R.A.F. for certain repair and alteration work, and is building machines to its own designs.

A two-seater Corps Reconnaissance monoplane, of the thick wing rigidly braced type, equipped with a Bristol "Jupiter" engine of 400 h.p., was completed early in 1923, for the British Air Ministry. This machine is known by the cryptic name of "The Hawker Duiker."

THE HAWKER "WOODCOCK."

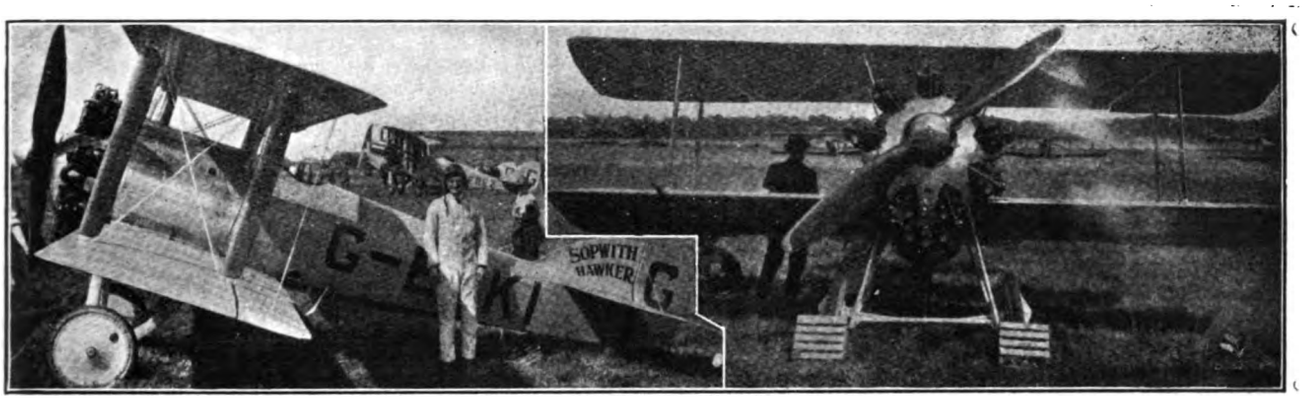
This is a single-seater of the more familiar biplane arrangement fitted with the "Jupiter" or "Jaguar" engine. Like the "Duiker," it may not be described in detail.

THE SOPWITH-HAWKER RACER.

For the 1923 Aerial Derby, the firm revived the machine produced for the 1919 Schneider Cup by the late Sopwith firm. The machine was modified and cleaned up and flown by F./Lt. (now Sq. Ldr.) Longton, finished second at an average speed of about 165 m.p.h. The machine was also entered for the 1923 Schneider Cup race, but was wrecked in the course of a test flight.

OTHER ACTIVITIES.

The firm is engaged in the construction of a single-seat fighter with a Rolls-Royce "Condor" engine, which is indescribable, and a pair of light aeroplanes for the 1924 Light Aeroplane Competition.



The Sopwith-Hawker Racer (400 h.p. Bristol "Jupiter" engine).

P

HANDLEY PAGE.

Handley Page, Ltd.

Offices: Cricklewood, N. Flying ground: Cricklewood.

After two years of experimental work in connection with early efforts to design a successful aeroplane, Mr. F. Handley Page started business as an aeronautical engineer, and on June 17th, 1909, founded the company which now bears his name.

Works were erected at Barking, covering about 10,000 feet, for the construction of aeroplanes—an ambitious venture at that uncertain period in the history of aviation.

The first machine to be produced by the company was a diminutive monoplane known as the "Bluebird," partly because of the form of its planes and partly because it was painted blue. This pioneer machine makes an interesting comparison with the Handley Page machines of the present day. The tail of the W8 Handley Page is nearly twice the size of its tiny forerunner, and it could with ease carry in its great fuselage many machines of the dimensions of the "Bluebird."

The "Bluebird" provided a certain amount of useful data before it reduced itself to wreckage on the flying ground at Barking. Various other monoplanes were designed, and some survived the rigours of the experimental periods and others did not.

In 1909 an experimental biplane was built for an aviation enthusiast in Liverpool, and in the same year a Handley Page monoplane was exhibited at the Aero Show at the Olympia, London. The following year another type of monoplane was exhibited, fitted with a low-powered horizontal engine with two opposed cylinders.

Slowly by this process of evolution data was accumulated, which eventually resulted in the design of an aeroplane which can be described as the first really successful Handley Page machine.

This was a monoplane, fitted with a 50 h.p. Gnôme engine. Its first pilot, the late Edward Petre, christened it the "Antiseptic," owing to the non-rusting paint which had been applied to it. The machine was exhibited at the Aero Show in London, and it performed, what were for those early days, very creditable

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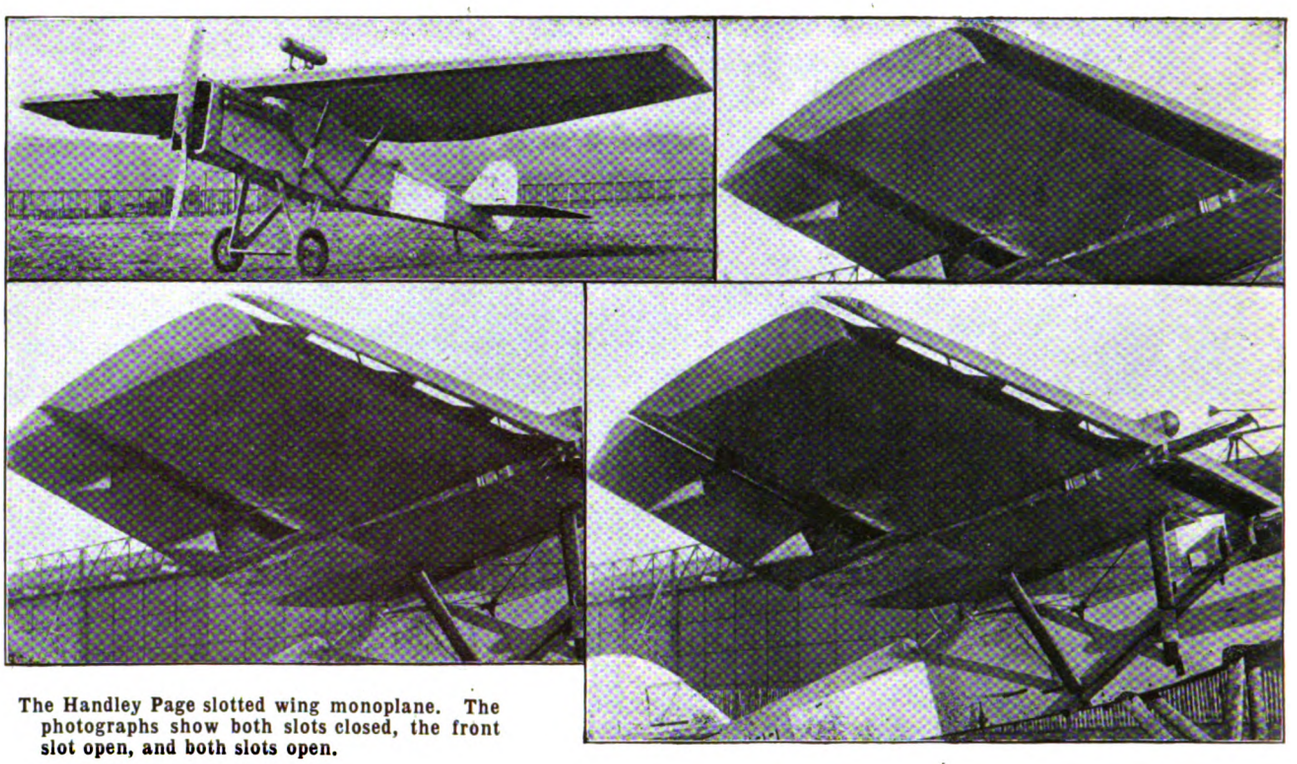

The Handley Page slotted wing monoplane. The photographs show both slots closed, the front slot open, and both slots open.

flights, one of which was between Fairlop, near Ilford, to the works at Barking, and a more remarkable one from Barking along the Thames through London to Brooklands.

The span of the planes of this machine was 35 feet.

A larger machine, fitted with a 70 h.p. Gnôme engine, was designed for the military aeroplane trials on Salisbury Plain in 1912.

The War Office then entrusted the firm with the making of machines of the B.E. type.

In 1912 the works were removed to Cricklewood. In the first instance the ground occupied was about five acres. The workshops have since been doubled in size.

Despite the increasing activities of the firm, experimental work was still assiduously carried on. A biplane with a 110 h.p. Anzani radial engine was produced, which had a speed of 75 m.p.h. and made a good impression at flying meetings at Buxton and Hull.

A new type of biplane on an ambitious scale was being perfected when the War broke out. It was to have been equipped with a 200 h.p. Salmson engine. The firm was taken over by the British Admiralty in 1914, and during war the works were engaged on the production of "giant" machines with multiple engines.

Lest it be supposed that the giant type is entirely a product of the War, it should be pointed out that the firm had conducted frequent experiments with big machines before Europe was thrown into a world-wide conflict. The results of these researches were placed before the Admiralty, who requested the immediate construction of a large experimental machine as suggested by the specifications.

THE HANDLEY PAGE SLOTTED WING MONOPLANE.

For the past two or three years Mr. Handley Page has been engaged upon research work of fundamental importance which has led to the development of what is now known as the Handley Page wing. It has been found if a wing of ordinary type is pierced near the leading edge by a slot of peculiar shape, sloping backwards from the under surface to the upper, that that wing will develop a very much higher maximum lift than will the same wing minus the slot. Also that a series of similar slots, extending across the wing and dividing it up into a series of narrow chord wings, can be used still further to increase the maximum lift.

The effect is very large—60% extra loading may be carried by a wing, without increasing the landing speed, by the use of only one slot, and up to 100% by the use of multiple slots. Opening the slots increases the resistance of the wing appreciably at relatively fine angles, but, with mechanical arrangements to open and close the slots, it is possible to use the low resistance qualities of a normal wing for normal flight, and the low speed of landing, rapid get-off and steep climb given by the open slot on one and the same machine. Experimental tests on a biplane fitted with such slotted wings having proved that the full-sized machine confirmed model tests, an experimental cantilever monoplane has been built and was being tested at the end of 1921, by the R.A.E. at Farnborough. This machine is illustrated herewith.

The wing is provided with one slot in the leading edge, which can be opened and closed by rocking about a hinge, the portion of the wing ahead of the slot.

In addition, the ailerons are arranged in such wise that, when pulled down, they open a second slot. Thus, when the wing with one slot is at its maximum lift—and the machine at its minimum speed—pulling down the aileron makes it a double slot wing, and still further increases the maximum lift. Adequate lateral control at minimum speed is thus secured.

THE HANDLEY PAGE W.8b.

The Handley-Page W.8b, which is used on the Handley Page London-Paris service, is a modification of the W.8, a machine produced some time ago, and used largely for experimental purposes. The W.8 has shown itself to have so many good qualities that the new machines are aerodynamically at least practically unaltered from the original model. The original was described in the 1922 issue of "All the World's Aircraft."

The original W.8 was fitted with two Napier "Lion" engines, each of 450 h.p. Experience convinced the Handley Page Company that the margin of power given by this installation was unnecessary, either for the sake of reliability or to maintain a high average of punctuality in their service, and the W.8bs are fitted with two Rolls-Royce "Eagles" of 360 h.p. each.

In the design of the W.8b great attention has been paid to details making for reliability, safety and the comfort of passengers. Very little change has been made in the structure, the engine mountings alone are appreciably altered. The whole of this mounting is composed of steel tube, and the engine is overhung ahead of the main planes. Only the oil tanks are carried in the engine nacelle, and the cowling is very short, scarcely extending past the leading edge. Each engine has a petrol tank of 100 gallons capacity, mounted on the top plane, giving a direct gravity feed.

Exhaust silencers, of the R.A.E. long tube type are fitted to the engines.

The arrangement of the saloon has been somewhat altered. Twelve seats are provided, in two rows, and there are light racks for hand luggage. The amount of leg room given to the passengers seems unusually ample, which is a very important point making for comfort.

Heavy luggage is carried in two compartments, one between the saloon and the pilot's seat, and another behind the saloon.

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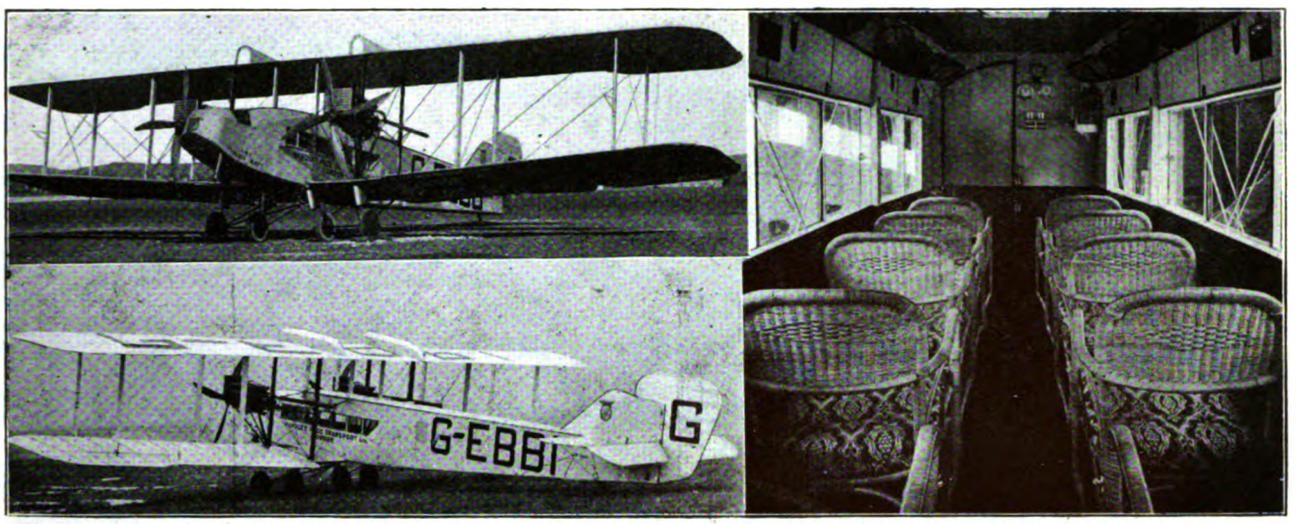


The Handley Page W.8.B. (Two 360 h.p. Rolls-Royce "Eagle" engines). On the left, interior of the Cabin.

There are separate entrances to these baggage rooms. There is a way through the fore baggage space from the saloon to the pilot's cockpit. Adequate ventilators are fitted to the roof of the cabin, and in addition every alternate window may be opened.

Folding wings are not fitted, on the grounds that at properly equipped terminal aerodromes folding is not required, and that if one has to land elsewhere, where folding wings might be advantageous, the personnel necessary to carry out the operation is not usually available.

The ailerons are balanced over their whole span. Three main ribs at each wing-tip are carried aft of the rear spar and the ailerons are hinged at a point well inside the leading edge, thus giving a balanced portion along the entire length of each aileron.

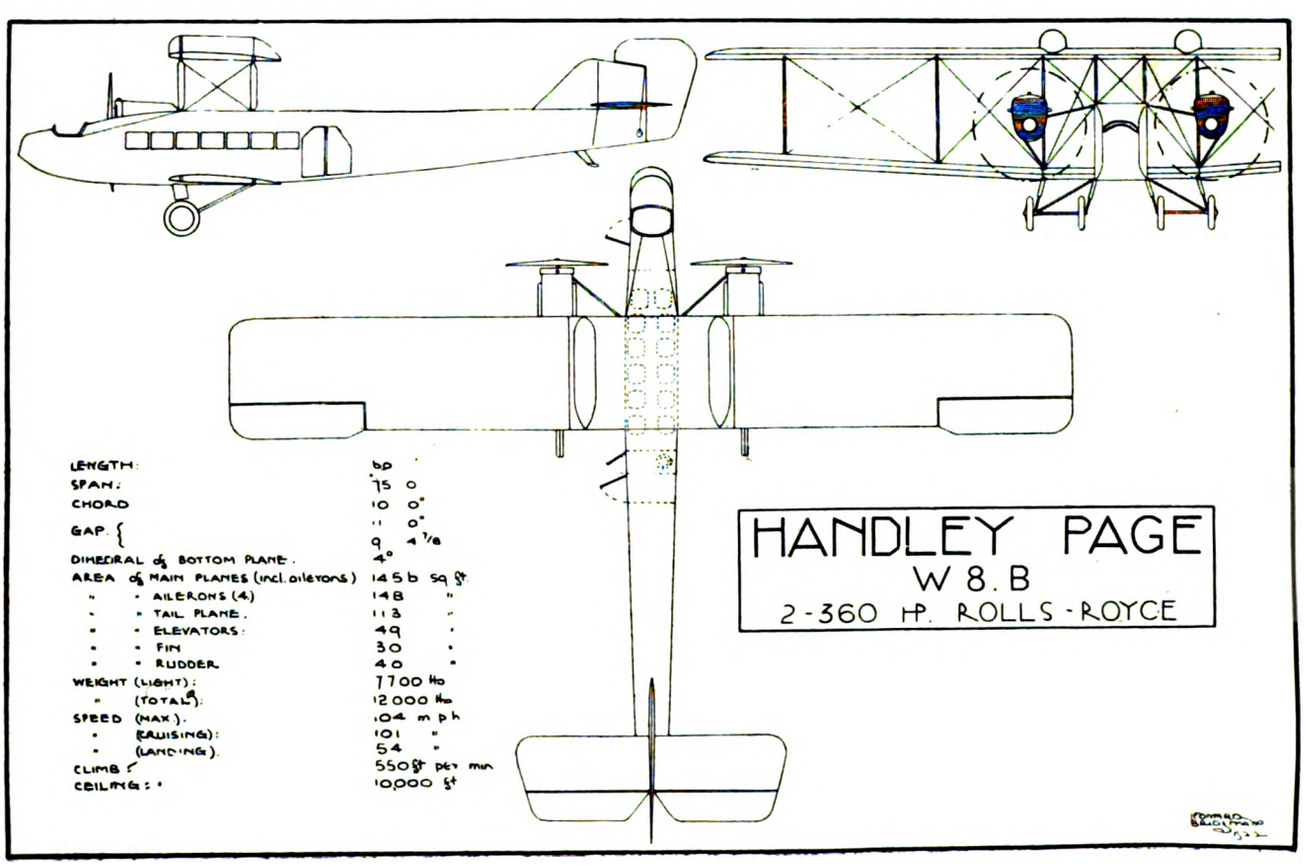
The undercarriage is in two parts and consists of four steel tube Vees mounted one under each engine and one under each outer edge of the fuselage, the front and rear legs being attached at points in line with the main spars. The front legs are fitted with rubber shock absorbers of the usual pattern, enclosed in metal streamline casings.

The pilot's cockpit is situated in the nose and contains the pilot's seat fitted on the right side, with a tip-up seat alongside for the use of a mechanic should one be carried. The following equipment is provided :—Wireless apparatus, two air-speed indicators (one in cabin), two altimeters (one in cabin), clinometer, two revolution indicators, two radiator thermometers, two oil-pressure gauges, two petrol level gauges, two oil thermometers, and two Pyrene extinguishers (one in cabin).

The main planes are of normal construction and are fitted with two sets of struts on either side of the engines. The strut-end fittings, when in position, are encased with metal sheathing to carry the lines of the strut right up to the plane surface.

The engine mounting is of steel tube construction. The engine bearers proper are in advance of the front struts and are supported by three bracing tubes running up from the bottom main spar fitting, and by two cross tubes from the top longeron of the fuselage. An oil tank of 6½ gallons capacity is provided in the rear of each engine. The tail plane is of the monoplane type, and all control surfaces, with the exception of the elevators, are balanced.

The general arrangement of the machine and the specification is shown in the attached scale drawing.


HANDLEY PAGE
W 8. B
2-360 HP. ROLLS-ROYCE
LENGTH: 62'
SPAN: 75' 0"
CHORD 10' 0"
GAP { 11' 0" / 9' 4 1/8"
DIHEDRAL of BOTTOM PLANE. 4°
AREA of MAIN PLANES (incl. ailerons) 1455 sq ft
" " AILERONS (4) 148 "
" " TAIL PLANE. 113 "
" " ELEVATORS: 49 "
" " FIN 30 "
" " RUDDER. 40 "
WEIGHT (LIGHT): 7700 lbs
" (TOTAL): 12000 lbs
SPEED (MAX). 104 m p h
" (CRUISING): 101 "
" (LANDING). 54 "
CLIMB: 550 ft per min
CEILING: 10000 ft

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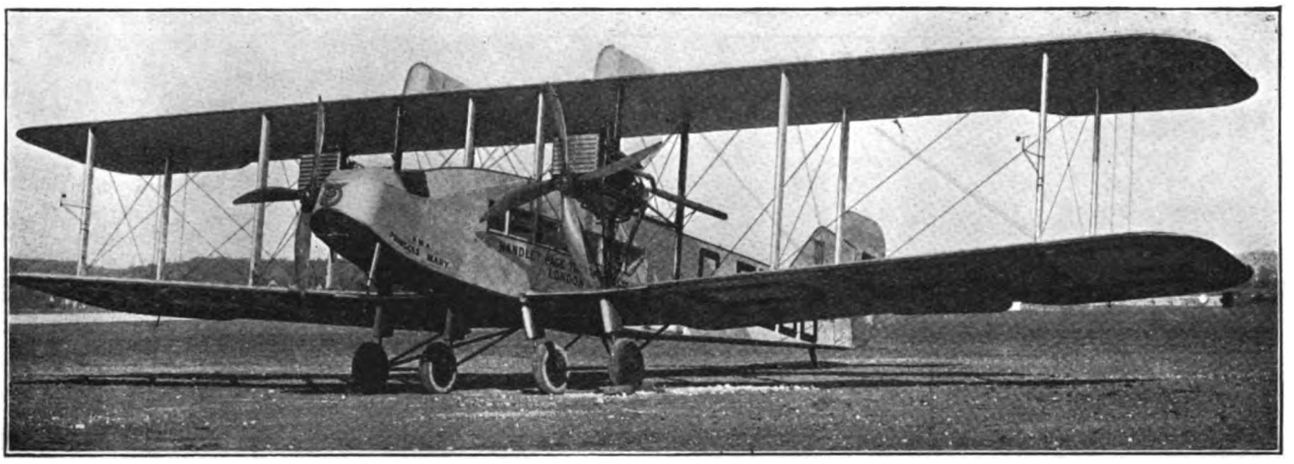


The Handley Page W 8.B (two Rolls-Royce " Eagle " engines).

THE HANDLEY PAGE W 8.F.

The Handley Page W 8.F. is a modification of the well-known W 8.B. type which has been designed specially with a view to producing a machine which shall be as nearly as it is possible to make it immune from involuntary landings caused by engine stoppage. These machines are to be used in the Belgian Congo, and it will readily be understood that absolute freedom from involuntary landings is of the very first importance for service in such a country.

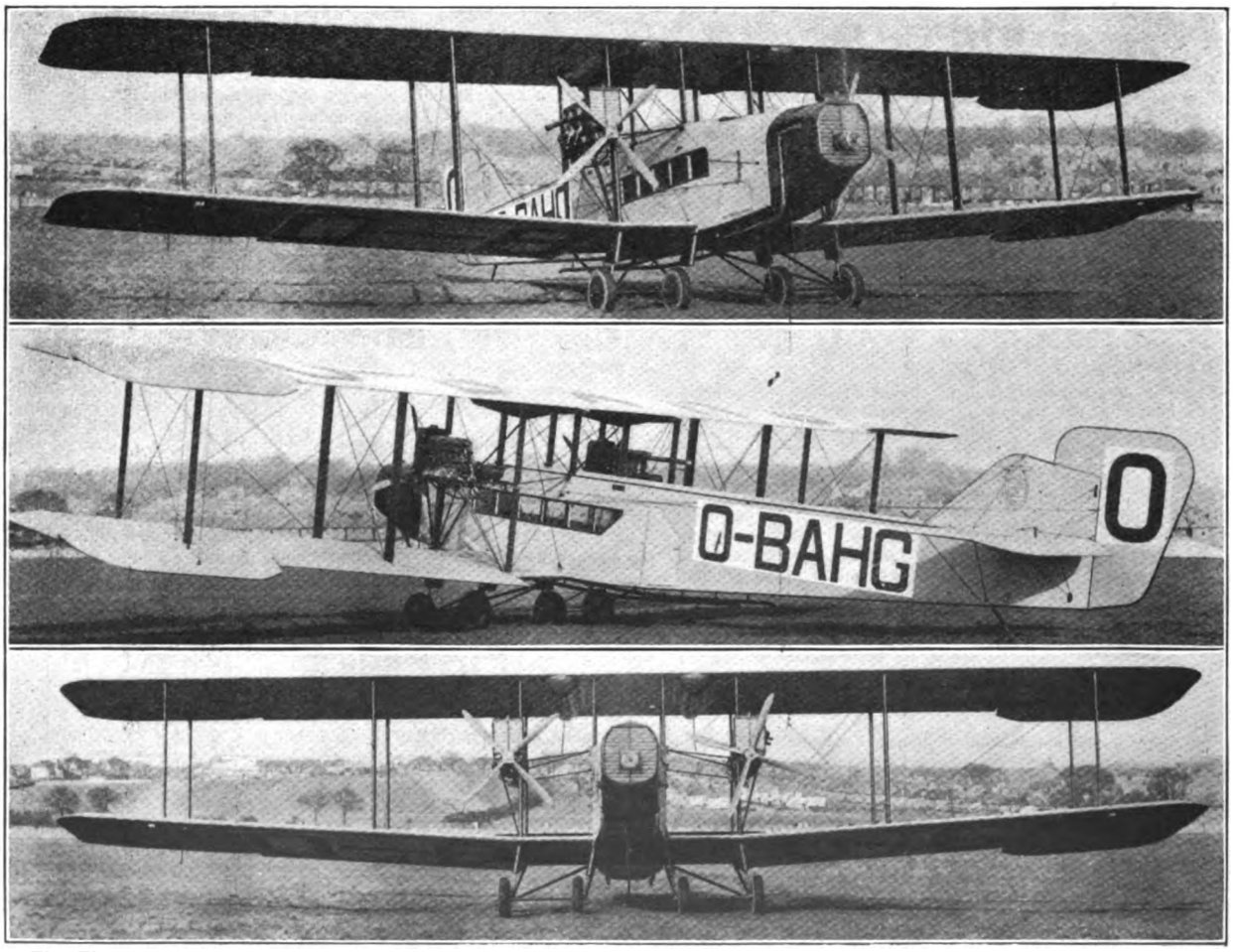
The W 8.F. is of the three-engine type. It is fitted with one Rolls-Royce " Eagle IX " engine of 360 h.p. in the nose of the fuselage, and with two Siddeley " Puma " engines, each of 240 h.p., on the wings in the positions occupied by the Rolls-Royce engines of the W 8.B.

With the Rolls-Royce " Eagle " alone in action, the W 8.F. ought to be quite comfortably flyable on the centre engine. With both Siddeley " Pumas " running and the central engine out of commission, the machine has two-thirds of the full power of the W 8.B. available—that is, it should cruise comfortably under those conditions.

With one " Puma " and the Rolls engine, it will have an extra 120 h.p. over that available with the two " Pumas "—which is considerably more than enough to offset the drag caused by rudder setting necessary to keep a straight course.

Thus the machine will not be forced to land by failure of less than two of its three engines, and even if both the Siddeley " Pumas " fail at the same time the central Rolls-Royce will suffice to keep the machine in the air for a very considerable time. Under the circumstances, forced landing from engine failure should be a most improbable occurrence.

The machine itself is, except for the power plant, practically a standard W 8.B. The wings, undercarriage, tail, and the greater part of the fuselage are actually identical with the same parts of the W 8.B. The nose of the fuselage ahead of the cabin has naturally been considerably modified. The pilot's seat is carried somewhat higher in the new type, and the top surface of the fuselage here is kept up to the full height of the



The Three-engined Handley Page W 8.F. (Rolls-Royce " Eagle IX " and two Siddeley " Pumas ").

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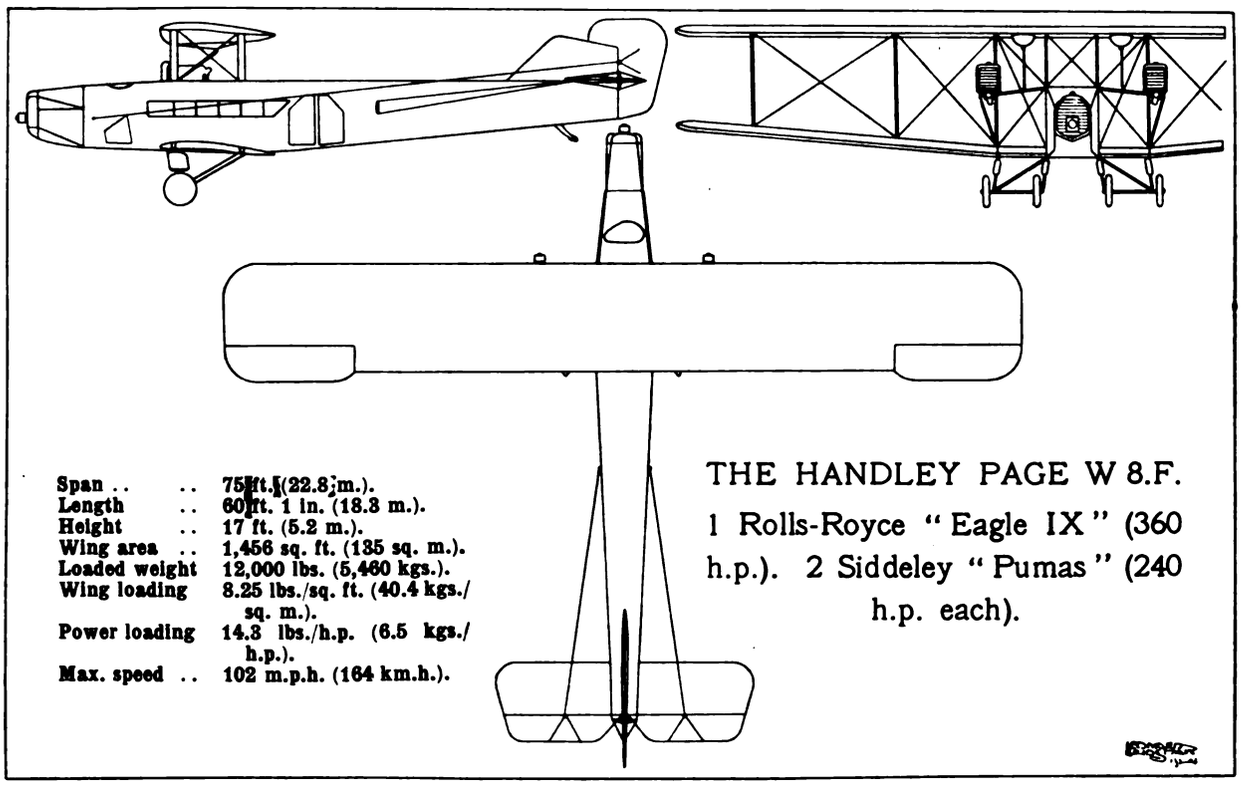
HANDLEY PAGE—*continued.*



Span	75ft. (22.8 m.).
Length ..	60ft. 1 in. (18.3 m.).
Height ..	17 ft. (5.2 m.).
Wing area ..	1,456 sq. ft. (135 sq. m.).
Loaded weight	12,000 lbs. (5,460 kgs.).
Wing loading	8.25 lbs./sq. ft. (40.4 kgs./sq. m.).
Power loading	14.3 lbs./h.p. (6.5 kgs./h.p.).
Max. speed ..	102 m.p.h. (164 km.h.).

THE HANDLEY PAGE W 8.F.

1 Rolls-Royce "Eagle IX" (360 h.p.). 2 Siddeley "Pumas" (240 h.p. each).

cabin roof. The engine mounting, a triangulated steel tube structure, is built out from the end of the fuselage and isolated from the cockpit by the normal fireproof bulkhead.

Below the pilot's seat there is a luggage compartment, as in the W 8.B., but owing to the increased height of the pilot's seat this compartment is of greater volume in the new machines.

In the W 8.B. the engine mountings were carried from a single pair of vertical interplane struts on each side—the engine bearer tubes being carried from a sort of bracket structure offset to the outer side of the interplane struts. The two "Pumas" on the wings of the W 8.F. are similarly carried on the outboard side of the inner pair of interplane struts. But whereas in the two-engined type the engines are entirely ahead of the front spar of the wings, in the new machine the wing engines are much further back in order to balance the added weight of the engine in the nose, and in the ordinary way the engines would have had to be offset from the vertical struts by a very considerable amount in order to clear the struts.

To keep the engines as close into the struts as possible, the engines have been tilted out of the vertical by some 15 degrees, which gives them a somewhat curious appearance.

The radiators, however, are mounted ahead of the engines in a normal attitude, and a casual glance at the front of the machine would not indicate the curious attitude of the engines themselves.

Honeycomb radiators fitted with normal type shutters are fitted ahead of each of the three engines. The central engine is fitted with long exhaust pipes which pass below the fuselage to right aft of the passenger cabin. Below the fore end of the cabin these pipes are surrounded by hot air muffs, which supply warmed air to the cabin above. The delivery of hot air to the cabin is controlled by a valve in the cabin itself.

The starboard "Puma" engine, whose exhaust ports face the cabin, is also fitted with a long exhaust pipe. The other "Puma," which exhausts away from the cabin, has a shorter exhaust pipe. These arrangements, it is hoped, will secure relative peace in the cabin, but will doubtless be modified if experience proves that more complete silencing is necessary.

The petrol supply is carried in two tanks in the upper wing between the wing engine struts and the centre section struts, and all carburettors are gravity fed, the available head for the wing engines being at least 8 ft., while that for the centre engine is considerably more. Standard tanks carry 125 gallons each, but alternative tanks of 190 gallons each way may be fitted instead. An independent oil tank is carried behind each of the three engines.

The passenger cabin is precisely similar to that of the W 8.B., and is fitted provisionally to carry ten passengers, on the assumption that a considerable quantity of mail and freight will also be carried. The cabin can, however, be fitted to carry up to 14 passengers if a reduced load of freight is carried. A lavatory is fitted to the after end of the cabin, and behind this and entered through a separate door is a large luggage compartment.

As has already been mentioned, the wings, undercarriage, and tail unit are identical with those of the standard W 8.B., and their form is adequately shown by the general arrangement drawing reproduced.

The Handley Page "Hanley" Torpedo Carrier (450 h.p. Napier "Lion").

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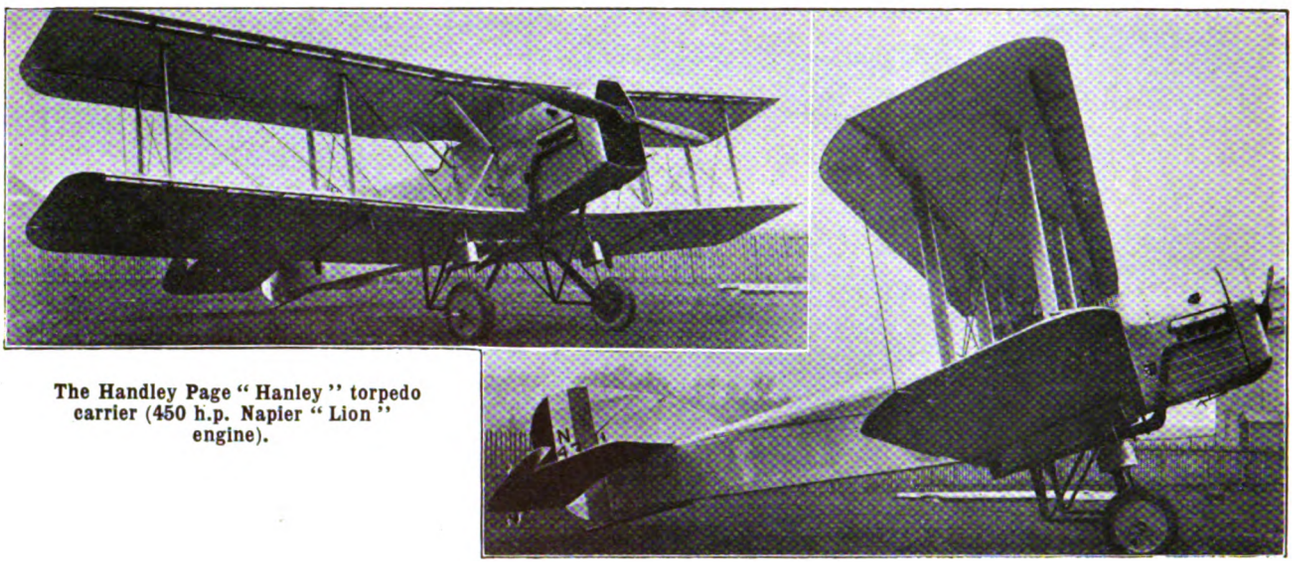
HANDLEY PAGE—continued.



The Handley Page "Hanley" torpedo carrier (450 h.p. Napier "Lion" engine).

THE "HANLEY" TORPEDO CARRIER.

The success of the preliminary tests with the Handley-Page slotted wing led the Air Ministry to place an order for a type of torpedo-carrying machine for ship use, embodying the slot wing in its design.

This machine, known as the "Hanley" Torpedo-Carrier, is shown in a scale drawing and in photographs.

It is a normal type tractor biplane, with a divided undercarriage, to give a clear drop for the torpedo. In order to allow for the very large stalling angle of the slotted wings, and to permit landing at the minimum speed, the undercarriage is arranged to give a fairly large angle when the machine is at rest on the ground.

The slot in this machine is confined to the leading edge. The front portion of the wing is carried, by projecting ribs from the main wing behind, on a steel tube spar, and this spar is rotated by the pilot by means of a worm gear.

Slots have not so far been fitted to the ailerons as in the experimental monoplane already mentioned, but there is reason to expect that this will be done in future specimens of the type.

The machine has given very satisfactory results on test, and it may be expected that this type of wing will prove to be particularly valuable for all types of deck-landing aeroplanes.

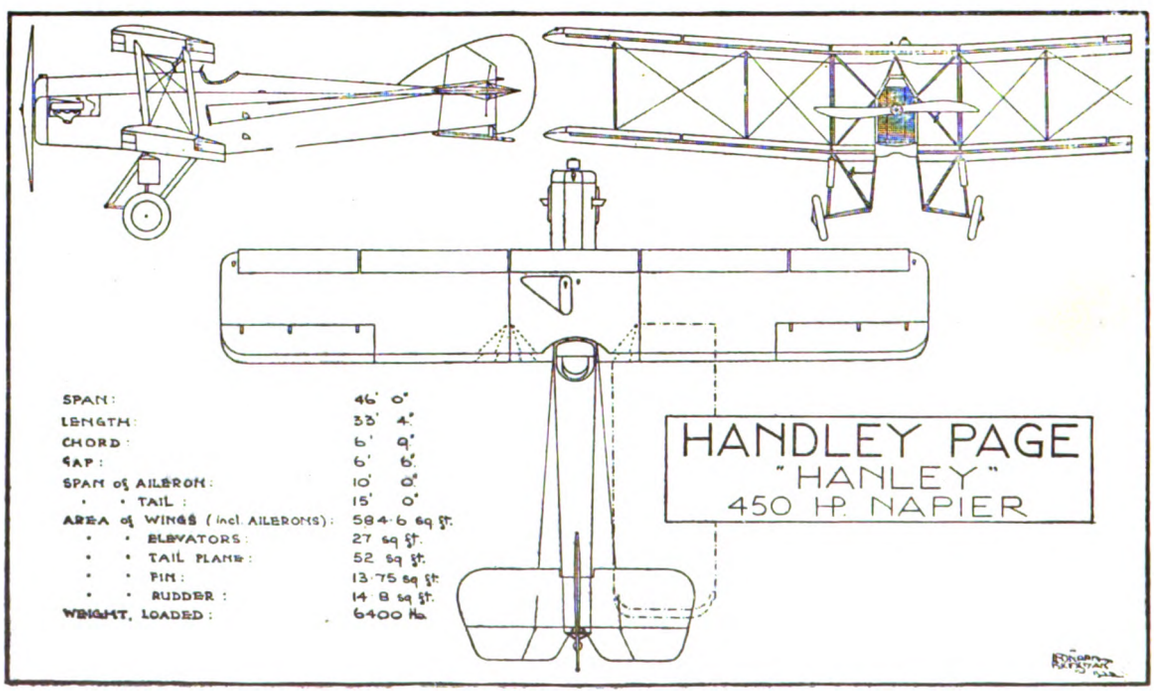
THE HANDLEY-PAGE SHIP FIGHTER.

Handley-Page, Ltd., have in course of construction a very interesting single-seat machine designed to the order of the United States Navy.

The machine is a ship fighter fitted with interchangeable wheel and twin-float undercarriages.

It is a cantilever monoplane with an extremely high wing loading, fitted with a slotted leading edge and with slotted flaps along the whole rear edge of the wing.

It is equipped with a B.R.11 engine of 230 h.p., and on test developed a speed of 146.5 m.p.h. (245 km.h.).


HANDLEY PAGE
"HANLEY"
450 H.P. NAPIER
SPAN: 46' 0"
LENGTH: 33' 4"
CHORD: 6' 9"
GAP: 6' 6"
SPAN of AILERON: 10' 0"
" " TAIL: 15' 0"
AREA of WINGS (incl. AILERONS): 584·6 sq ft.
" " ELEVATORS: 27 sq ft.
" " TAIL PLANE: 52 sq ft.
" " FIN: 13·75 sq ft.
" " RUDDER: 14·8 sq ft.
WEIGHT, LOADED: 6400 lbs.

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HANDLEY PAGE—*continued.*

The Handley Page Light Aeroplane (397 c.c. A.B.C. engine) flown by Mr. Olley, at Lympne.

THE HANDLEY PAGE LIGHT AEROPLANE.

A cantilever monoplane with a 397 c.c. "A.B.C." engine, built for the 1923 Light Aeroplane trials. The fuselage is a fabric-covered type, with spruce strut "N" bracing on the sides and top, and with three-ply covering on the bottom. The undercarriage consists of an axle working in horn plates in the side of the fuselage, only the lower half of the wheels projecting.

The wings are entirely devoid of external bracing and sprung from about two-thirds of the height of the fuselage from the top rail. The ailerons, which are of high aspect ratio, are fitted with a fixed Handley-Page "slot."

The pilot is seated just ahead of the front spar, and is entirely inside the fuselage, the cockpit being covered by a domed roof in which port-holes are cut to give a reasonable view.

An entirely movable partly-balanced tail plane, a moderate-sized fixed fin, and a large rectangular rudder entirely above the tail plane form the tail unit.

The engine, mounted on the front bulkhead of the fuselage, is encowled, except for the cylinders, and drives the airscrew direct.

The engine suffered severely from carburation and other troubles at Lympne, but in the intervals the machine flew extremely well.

Specification.

Span	**36 ft. (10.96 m.).**
Length	**17 ft. (5.18 m.).**
Height	**3 ft. 2 in. (.96 m.).**
Chord	**5 ft. to 3 ft. 4 in. (1.52 m. to 1.01 m.).**
Wing area	**157 sq. ft. (14.6 sq. m.).**
Weight light	**250 lbs. (117 kgs.).**
Weight loaded	**430 lbs. (195 kgs.).**
Wing loading	**2.75 lbs./sq. ft. (1.34 kgs./sq. m.).**

PARNALL.

George Parnall & Co. Works and Office: Coliseum Works, Park Row, Bristol. Factories: Mivart Street, Quaker's Friars, and Feeder Road.

During the War the firm of Parnall & Sons, of Bristol, acquired an excellent reputation as manufacturers of aircraft to official specification. Mr. Harold Bolas, of the Admiralty Air Department, was released to them as a designer, and the firm was asked to undertake original design work.

At least one of their designs, the "Panther," reached the production stage—which, considering the late date at which they entered the designing field, and the difficulties attendant upon the production of a shipboard aeroplane, redounds distinctly to their credit.

After the Armistice the firm of Parnall & Sons came under the proprietorship of W. & T. Avery, Ltd., and has definitely abandoned the production of aircraft.

Mr. George G. Parnall has, however, organised the firm of George Parnall & Co., and with the assistance of a personnel largely composed of those who conducted the aircraft department of Parnall & Sons, now carries on the business of aircraft designers and constructors.

Mr. Harold Bolas, M.B.E., B.Sc., A.M.I.C.E., A.F.R.Ae.S., is acting as the firm's designer, and Mr. Parnall is to be congratulated upon his courage and enterprise in initiating such a business at this time, and upon the success with which his efforts have so far been attended.

THE PARNALL "PUFFIN."

The machine shown in the attached photographs is the first product of the firm of George Parnall & Co., of Bristol.

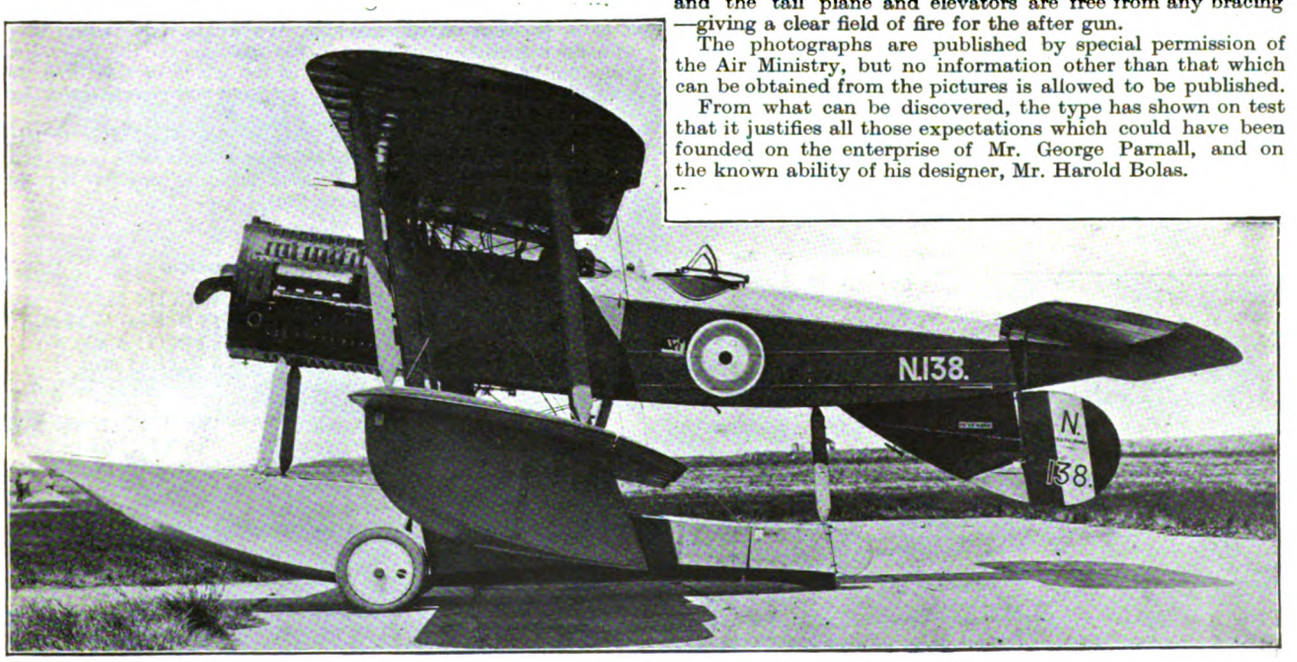
As may here be seen from the photographs, the machine is a central-float seaplane amphibian possessing a number of curious features. The extreme length of the central float is noticeable, together with the fact that the extreme after-end thereof is a separate structure supported from the fuselage by a special strut.

This strut is attached to a compression rubber shock-absorber in the fuselage and the whole unit acts as a tail skid when the machine is on its wheels.

Large wing-tip floats are fitted, owing to the lateral instability of the central float arrangement, and this machine compares most favourably with two-float seaplanes for manœuvrability on the surface. The tail unit is also unusual, as the fin and rudder are entirely beneath the fuselage, and both these organs and the tail plane and elevators are free from any bracing—giving a clear field of fire for the after gun.

The photographs are published by special permission of the Air Ministry, but no information other than that which can be obtained from the pictures is allowed to be published.

From what can be discovered, the type has shown on test that it justifies all those expectations which could have been founded on the enterprise of Mr. George Parnall, and on the known ability of his designer, Mr. Harold Bolas.



Side view of the Parnall "Puffin" (450 h.p. Napier "Lion" engine).

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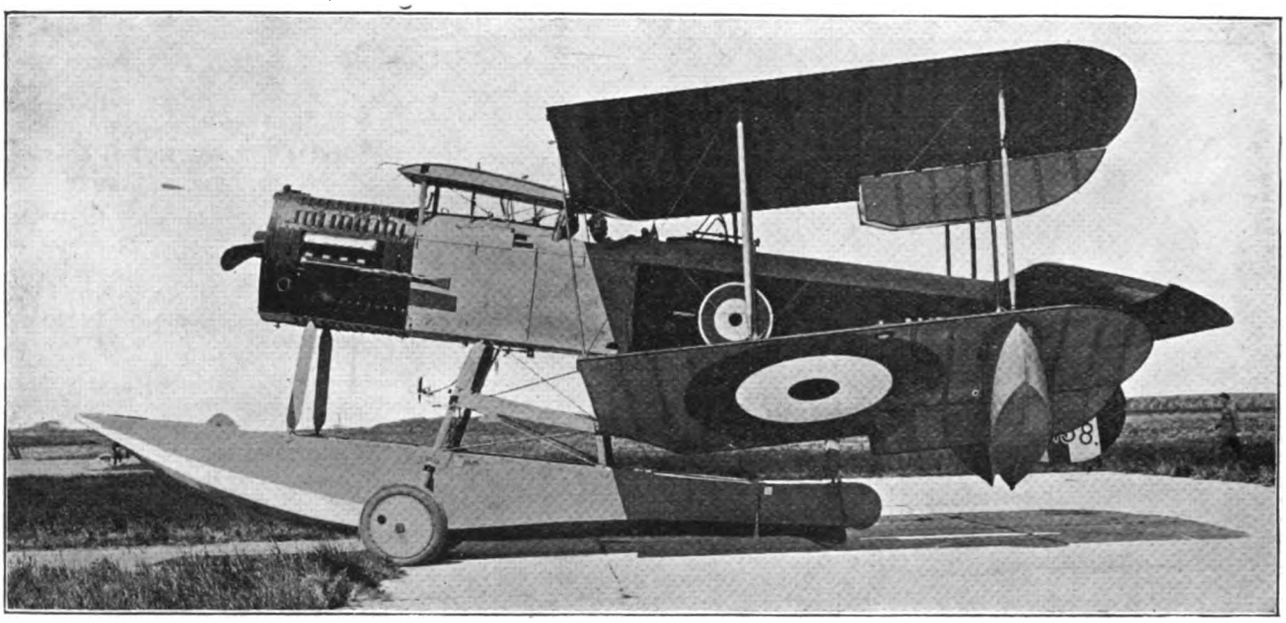
PARNALL—*continued.*



The Parnall "Puffin," (Napier engine), wings folded.

THE PARNALL "POSSUM."

The machine is essentially an experiment intended to examine the merits of central engine units with gear drives to airscrews on the wings. In a final and ambitious form the system would embrace a large central engine-room containing the whole of the power plant with engineers in charge who could attend to the motors and even perform repairs in the air in case of breakdown of any one power unit, the machine flying in the meantime upon its remaining units.

The "Possum" has a gear drive of the simplest type embracing a single Napier "Lion" engine in the fuselage driving the airscrews on the wings through bevel boxes and wing shafts. Clutches, with their weight and liability to trouble, have been eliminated.

Although the method of mounting the engine and airscrews involves more weight (about 1 lb. per h.p.) than is found in normal methods, the arrangement has distinct advantages. Thus pilot and observer have as good a forward and downward view as in a twin-engined machine, while the danger of one airscrew suddenly cutting out in flight is eliminated. Slipstream over body or nacelle is avoided, with consequent improvement in aerodynamic efficiency and owing to the concentration of weight, the machine should be very manœuvrable.

Detailed tests will show whether these advantages and the improvement in airscrew efficiency are sufficiently great to outweigh the increase in weight due to the embodiment of the geared drives.

The design is quite clean—a triplane arrangement of wings has been adopted which allows the wing driving shafts to be neatly concealed within the leading edge of the middle wing. The form of wing bracing adopted makes the mounting for the gear boxes extremely rigid and no undue vibration is experienced when the engine is running. Furthermore the universal joints fitted to the wing driving shafts and casings allow for small relative movements without throwing undue stress on to the driving shafts.

Accommodation is provided in the fuselage for three. The wireless operator and pilot are in front of the wings (pilot behind) and the engineer in a cockpit behind the engine. Dual control is provided for the two front cockpits, and the engine is started by means of a handle in the rear cockpit. The radiators are hinged to the sides of the fuselage and fold back to decrease the cooling, being operated by a wheel in the pilot's cockpit. All controls are balanced to render the machine light to fly.

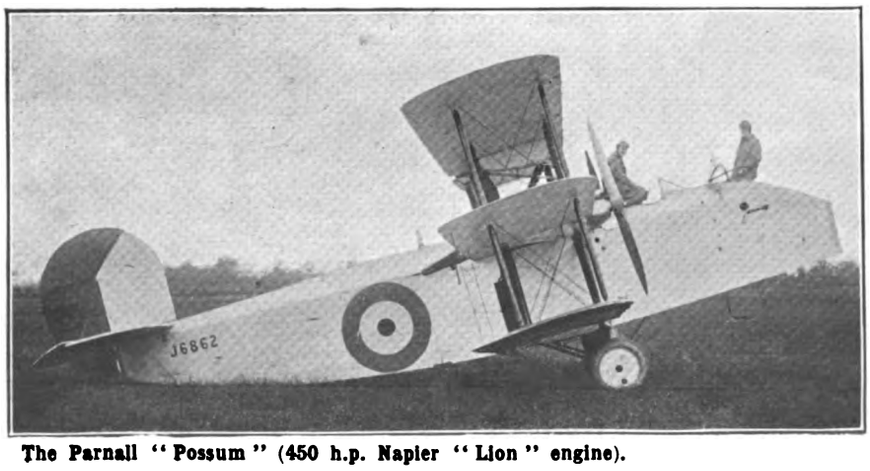
The undercarriage is combined oleo and compression rubber type and is singularly light for this size of machine. Special attention has been paid to handling and steering the machine on the ground. For this reason the usual tail skid has been replaced by a steerable tail wheel fitted with brakes. The brakes are applied by the load on the wheel itself and not by hand. Thus the braking force is always proportional to the load on the wheel and, when properly adjusted, no skidding can take place. A lever in the pilot's cockpit allows the braking effect to be removed when getting off or taxying.

As a result of using the steerable tail wheel the machine can be turned around its own wing tip when taxying at walking pace and, in fact, can be handled as easily as a small motor car. A further advantage is that the need for a handling tail-trolley is entirely eliminated.

No particulars can be given as to the internal fittings of the fuselage or equipment carried by the machine, as this triplane is being built to order of the British Air Ministry.

The engine and gears were severely tested on the bench and in position on the machine, the whole unit having been run for a further nine hours in the machine on the ground at nine-tenths of full power. During the whole of this time the engine and gears ran smoothly and no undue noise was experienced from the gears.

The machine has flown for several hours—including Official test flights, which were entirely satisfactory. The absence of slipstream over the fuselage and cockpits makes her an extremely pleasant machine to fly.



The Parnall "Possum" (450 h.p. Napier "Lion" engine).

Specification.

Span	**46 ft. (14 m.).**
Height	**13 ft. 9 in. (4.24 m.).**
Length	**39 ft. (11.8 m.).**
Chord	**6 ft. (1.83 m.).**
Gap	**4 ft. 6 in. (1.37 m.).**
Dihedral	**2½°.**
Wing area	**777 sq. ft. (72 sq. m.).**
Airscrew diam.	**9 ft. 6 in. (2.9 m.).**
Airscrew centres	**14 ft. 6 in. (4.42 m.).**
Airscrew r.p.m.	**1,180.**
Weight loaded	**6,300 lbs. (2,860 kgs.).**
Engine	**Napier "Lion" 450 h.p.**
Wing loading	**8.15 lbs./sq. ft. (40 kgs./sq. m.).**
Power loading	**14 lbs./h.p. (6.3 kgs./h.p.).**

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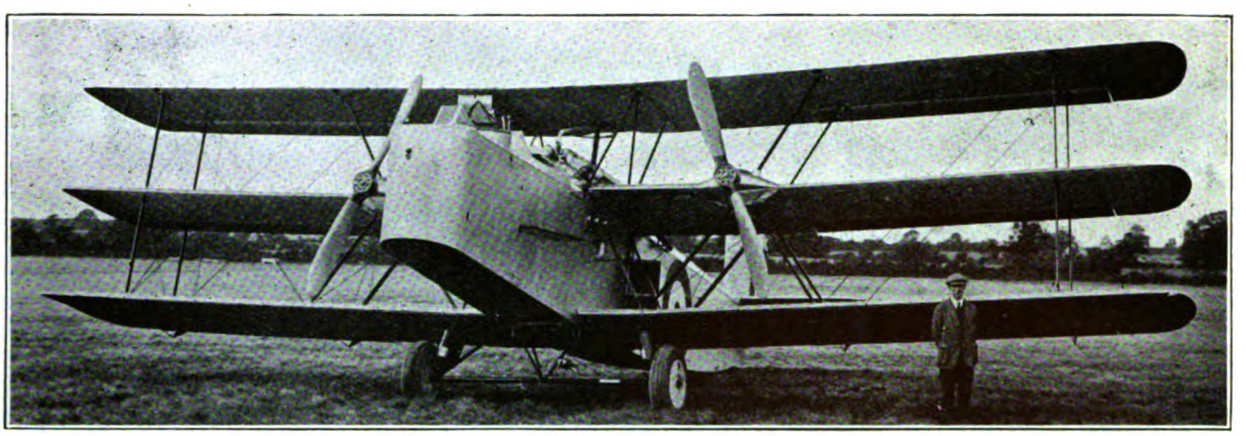
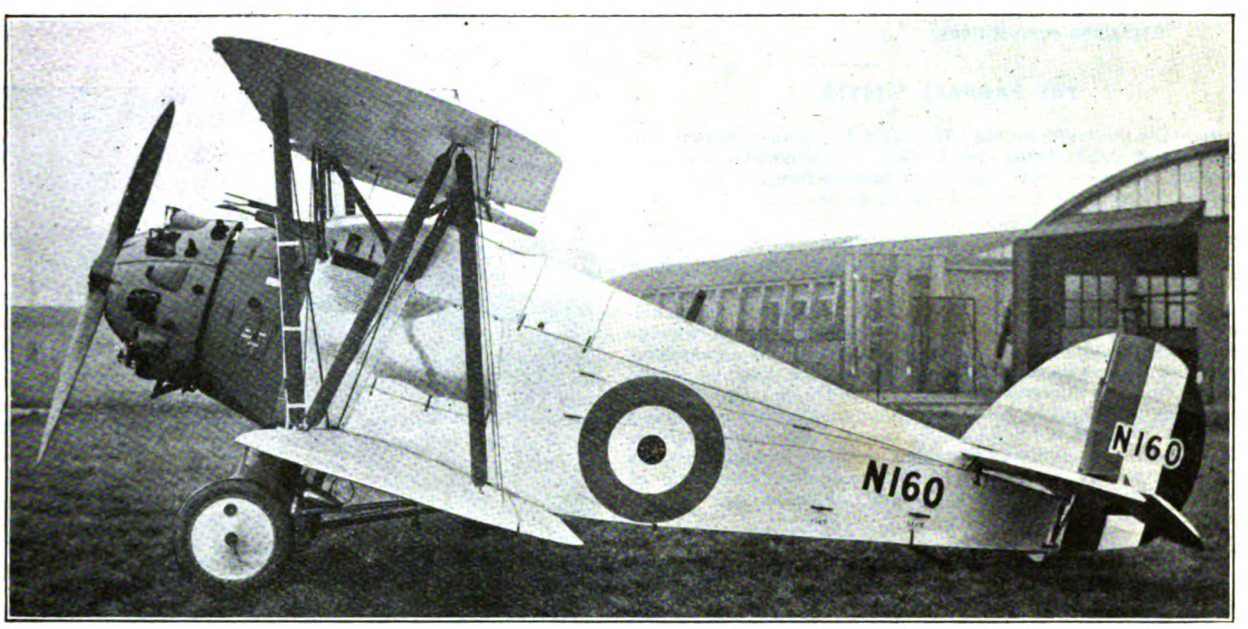
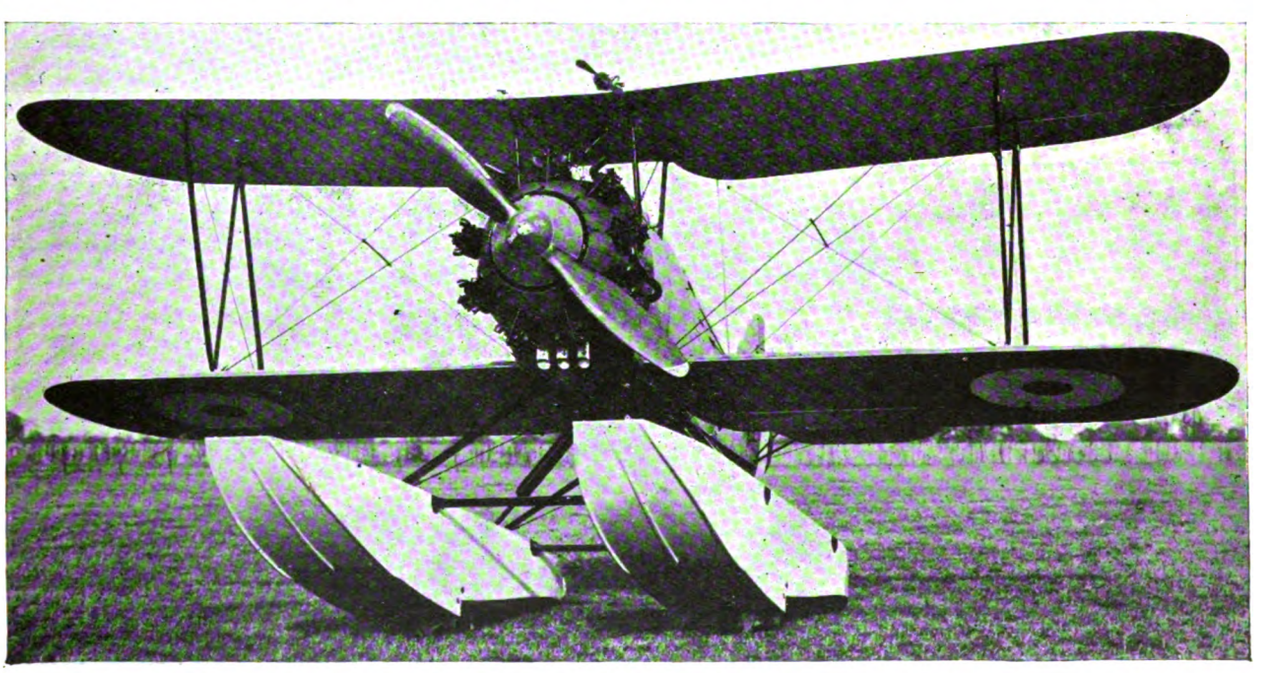


The Parnall "Possum" an experimental single-engined twin-screw triplane.



The Parnall "Plover" (Siddeley "Jaguar" engine), a high-speed single-seat fighter which may not yet be described.



The Parnall "Plover," fitted with Bristol "Jupiter" engine and a float amphibian undercarriage with fixed wheels.

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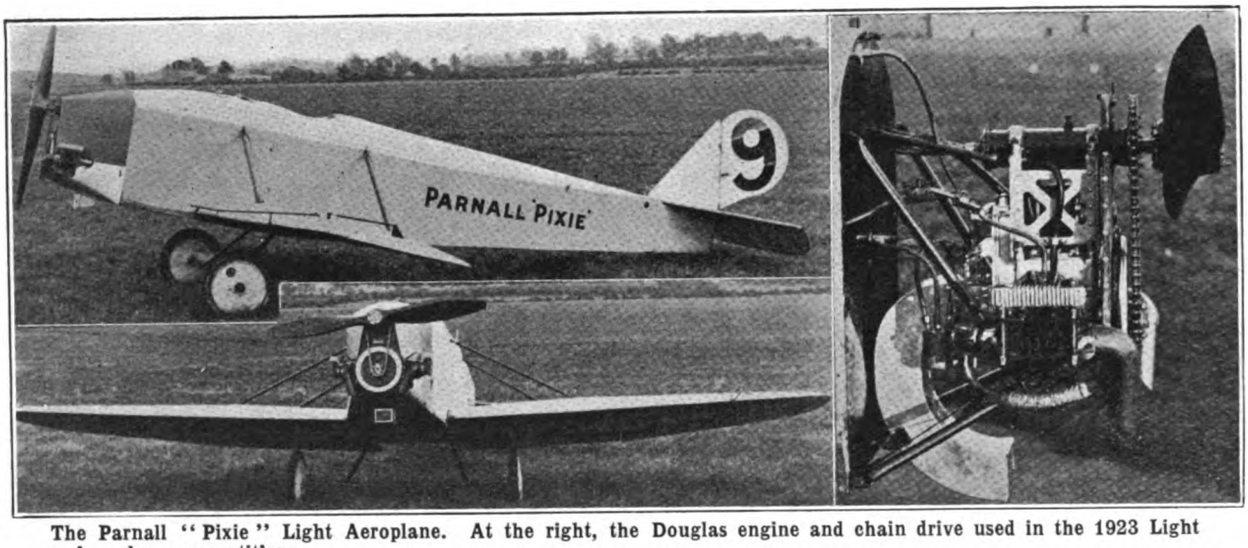


The Parnall "Pixie" Light Aeroplane. At the right, the Douglas engine and chain drive used in the 1923 Light Aeroplane competitions.

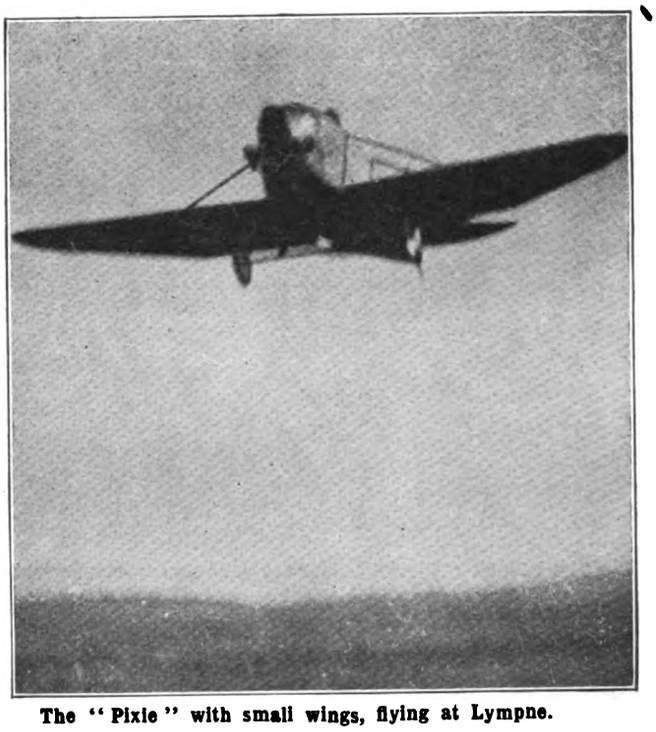
THE PARNALL "PIXIE."

Originally produced for the 1923 Light Aeroplane Competitions where it won the Abdullah speed prize. This machine is a small low-wing monoplane with rigid strut bracing from the top of the fuselage. The inner portion of the wings are of uniform chord, but over the outer half span the trailing edge is swept forward very considerably. The fuselage is of spruce, braced by diagonal spruce struts, all joints being made with three-ply gusset plates glued and inverted.

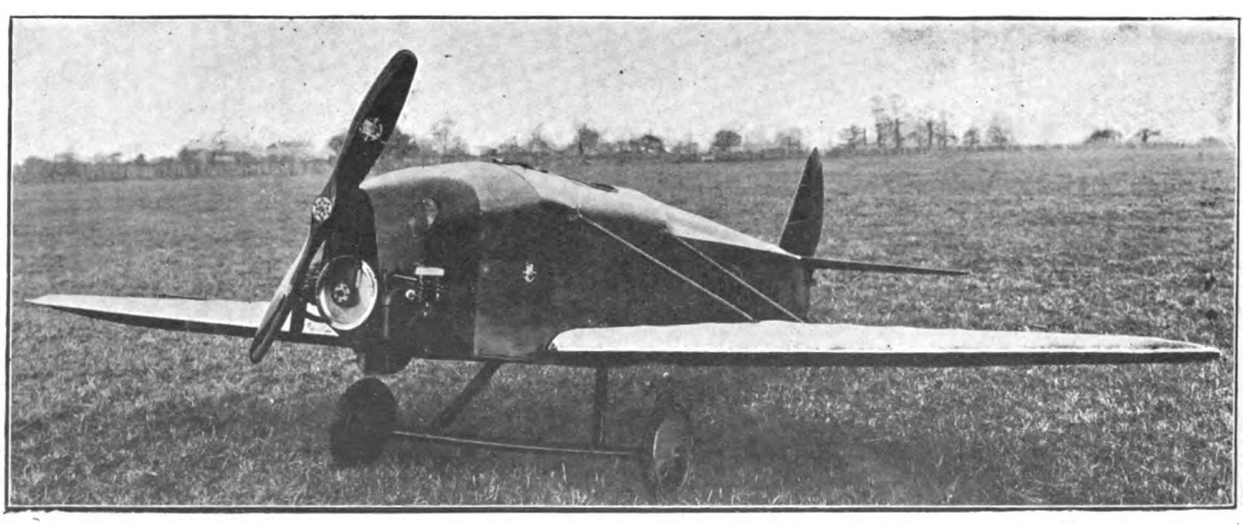
The undercarriage is remarkable. An inverted V of nickel-chrome steel tube is attached to the fuselage cross-member behind the pilot's cockpit. These tubes diverge outwards as they pass downwards through sockets at the bottom of the fuselage, to meet the steel axle which is rigidly attached to them. The axle considerably overhangs the supporting tubes and carries at its ends normal landing wheels. Springing depends entirely on the elasticity of the tubes, and this arrangement has proved extremely satisfactory. The tail unit, consisting of fixed tail planes and elevators, fin and rudder, is built entirely of steel.

The engine mounting is made as a separate structure attached to the front of the fuselage, ahead of a sheet metal bulkhead. The precise form of the mounting depends on the particular engine installed, but steel tube and swaged tie-rod bracing only is used in its construction, there being no timber ahead of the bulkhead.

The "Pixie" is built to take two alternative sets of wings, one of 29 ft. span and the other of 18 ft. span. With the large wings, a very low landing speed is secured, and the machine is eminently suitable for preliminary flying training or for work over country giving limited landing facilities. With the smaller wings an increased landing speed and greater maximum speed



The "Pixie" with small wings, flying at Lympne.



Three-quarter front view of the Parnall "Pixie."

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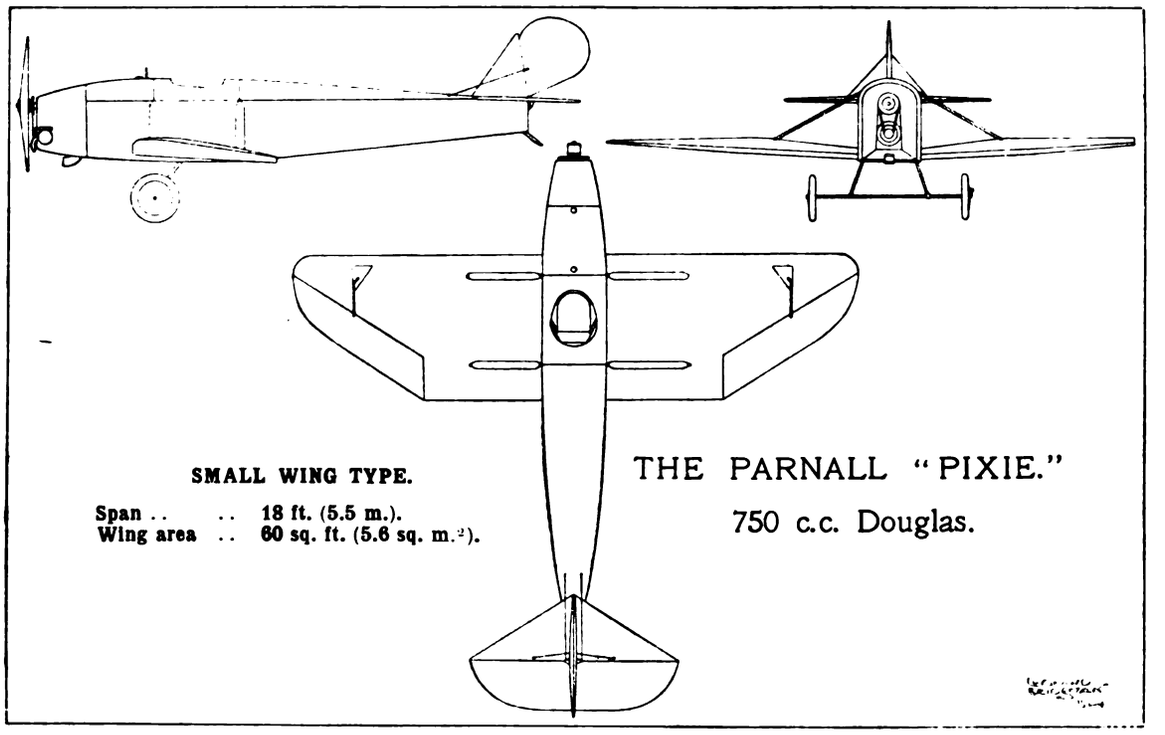
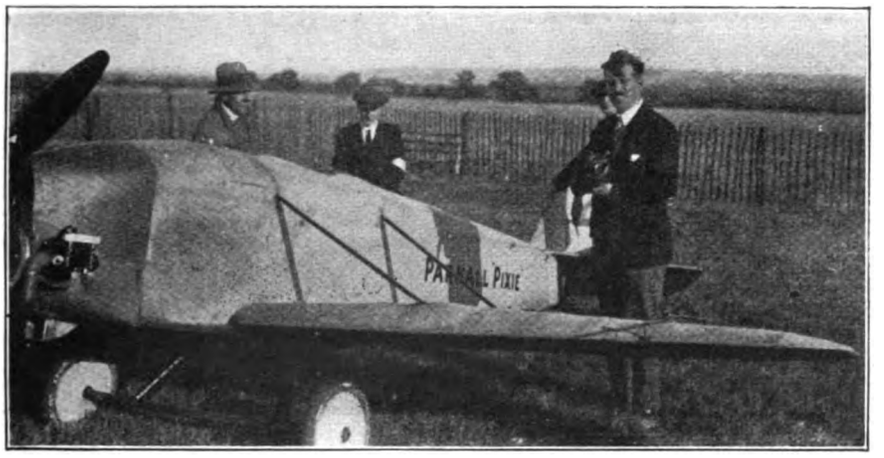


is attained, and the machine would then be suitable for more advanced training purposes.

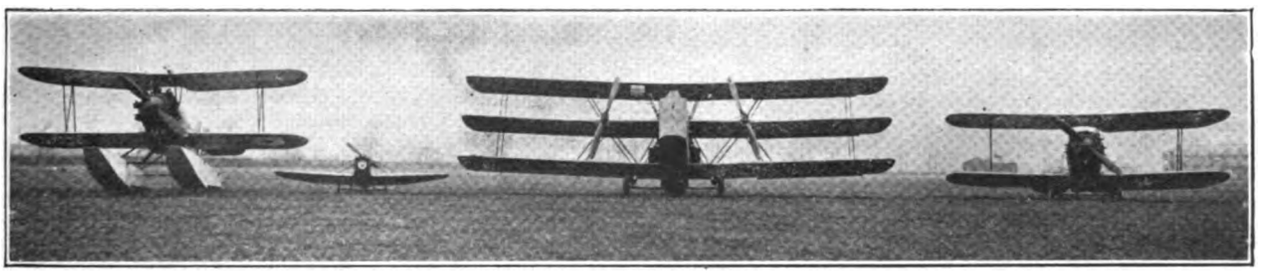
Almost any engine of suitable capacity can be fitted. At the 1923 Competitions a Douglas engine of 750 c.c. capacity was fitted, and with the small wings an average speed of 82 m.p.h. over a 12½ mile circuit was maintained in a wind of 35 m.p.h. The makers recommend either the Bristol "Cherub" of 1,095 c.c. or the Blackburne 1,000 c.c. engine as giving ample reserve of power.

The following is the estimated performance of the machine with the latter engine :—

	(*a*)	(*b*)
Span	**29 ft. (8.85 m.).**	**18 ft. (5.5 m.).**
Wing area ..	**100 sq. ft. (9.3 sq. m.).**	**60 sq. ft. (5.6 sq. m.).**
Landing speed	**33 m.p.h. (52 km.h.).**	**45 m.p.h. (73 km.h.).**
Top speed ..	**90 m.p.h. (145 km.h.).**	**105 m.p.h. (170 km.h.).**
Ceiling	**18,000 ft. (5,500 m.).**	**14,500 ft. (4,420 m.)**



Another view of the Parnall "Pixie" at Lympne.



Parnall Products :—Left to right, the "Plover" Amphibian, the "Pixie," the "Possum" and the Land "Plover."

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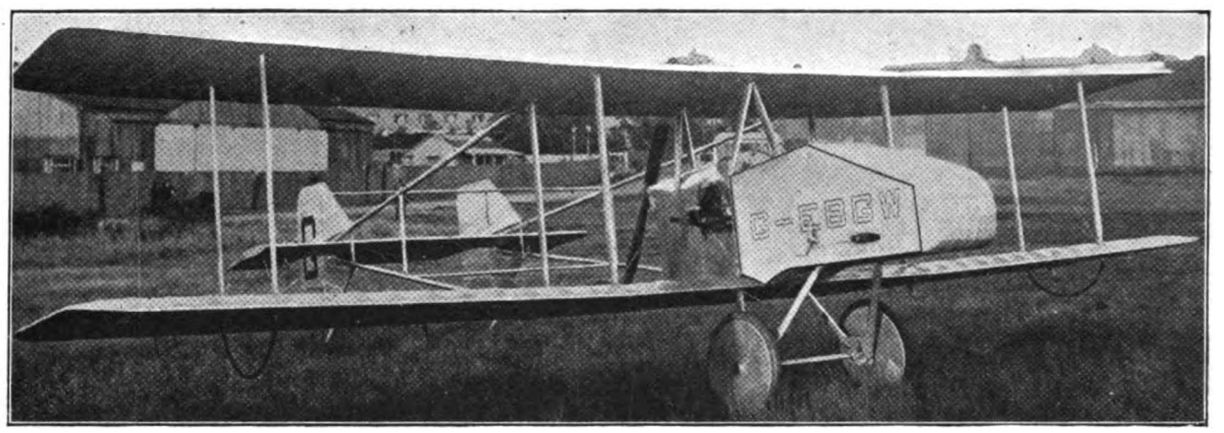
R

R.A.E. AERO CLUB.



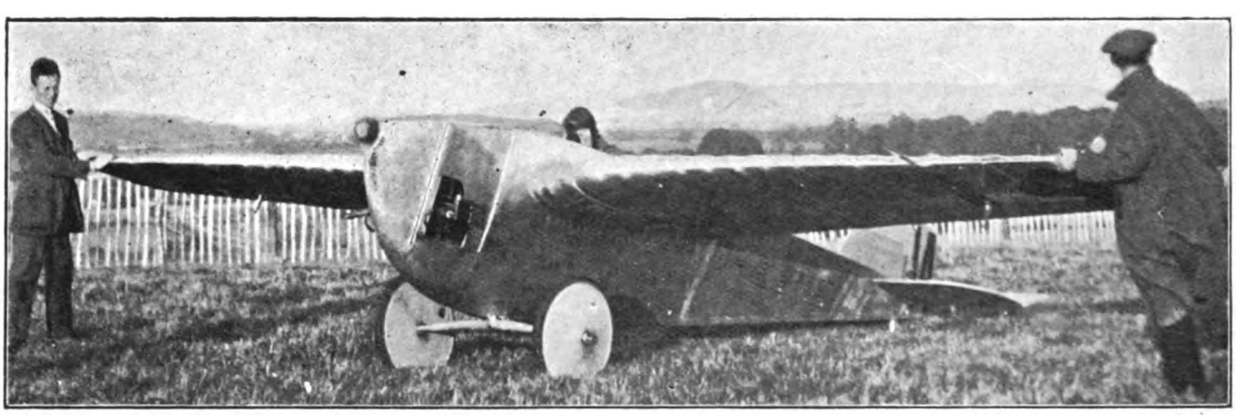
The R.A.E. Aero Club's "Zephyr."

Royal Aircraft Establishment Aero Club, R.A.E., Farnborough.

This Club was formed early in 1923 among the personnel of the R.A.E. for the purpose of constructing and flying light aeroplanes and gliders.

By communal effort the club built two light aeroplanes in 1923. Of these, one, known as the "Zephyr," is a lightly loaded pusher biplane fitted with a Douglas motor-cycle engine of 500 c.c. and a chain driven propellor. This machine flies extremely well.

The second machine, known as the "Hurricane," is a heavily loaded cantilever monoplane which was entered for the 1923 Lympne meeting with an eye to gaining the speed contest. This was fitted with a 600 c.c. engine of the same make and it was expected that a speed in the vicinity of 100 m.p.h. would be attained. The machine was constructed hurriedly and was not properly tuned up at the meeting but nevertheless flew quite well.



The R.A.E. Aero Club's "Hurricane."

S

SAGE.

Fredk. Sage & Co., Ltd., 58-62, Gray's Inn Road, London, W.C., also at Peterborough, and at 5, Boulevard des Italiens, Paris.

An old established firm of shopfitters who took up the manufacture of aircraft during the war of 1914-18.

The firm has ceased to manufacture aircraft, but intimates its willingness to accept orders if offered.

SAUNDERS.

S. E. Saunders, Ltd., East Cowes, Isle of Wight.

Famous makers of motor boats on Saunders' Patent principle. Made the hulls of the original Sopwith "Bat-boats" with marked success, and later specialised on hulls for flying-boats of various types. Took to making aeroplanes complete, and has won a high reputation for excellence of workmanship.

Later produced the famous "Consuta" system of sewing wooden sheets together. This has been used with much success in the hulls of flying boats.

The firm has recently re-established a design staff and work has begun on the construction of flying-boats and other aircraft.

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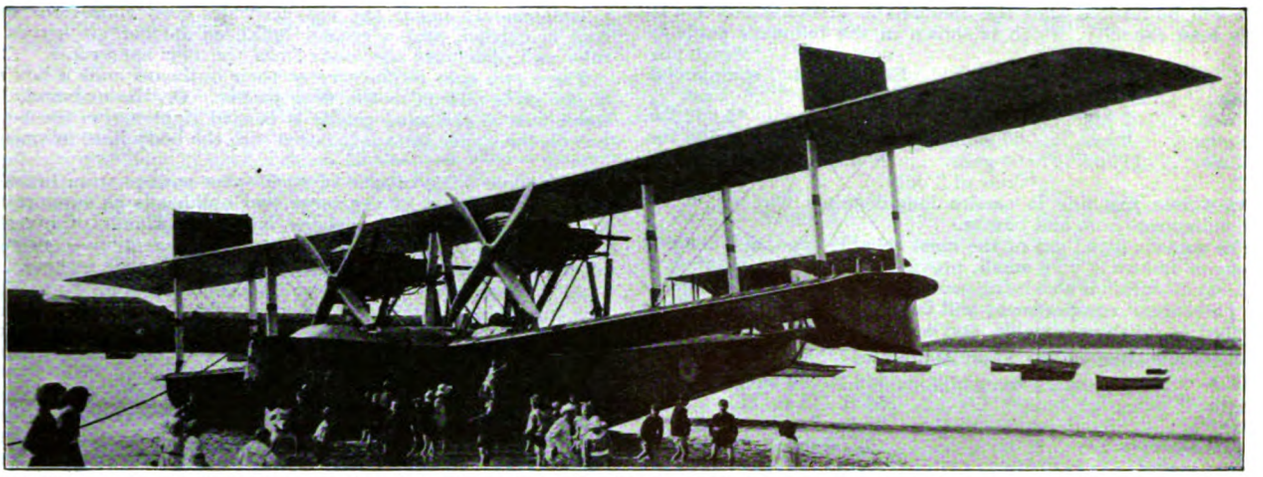
SHORT.



The Short "Cromarty" Flying Boat (2 Rolls-Royce "Condor" engines.)

Short Bros., Ltd. Works: Rochester, Kent. London Office: 29/30, Charing Cross, S.W.

The firm of Short Bros., which is the oldest established firm of aeroplane designers and producers in the United Kingdom, was founded by two brothers, Eustace and Oswald Short, in the year 1898, their work for some years being the manufacture of spherical balloons. In 1906 they nearly succeeded in winning the Gordon Bennett Race, and actually gained second place. In 1907 the firm was appointed "Official Aeronautical Engineers to the Royal Aero Club."

The two brothers were joined by their elder brother, the late Horace L. Short, in 1908, and they added to their balloon work the design and manufacture of aeroplanes, for which purpose they established works at Shellness, near Leysdown, in the Isle of Sheppey.

In 1909, a "Short" aeroplane, fitted with a Green engine, won the "Daily Mail's" £1,000 prize for a flight over a closed circuit by an all-British aeroplane, the pilot being Mr. J. T. C. Moore-Brabazon, later, Lt.-Col. R.A.F. and now M.P. The Short Bros. were also the British agents for the Wright Bros.

In 1910, the works were transferred to Eastchurch, adjacent to the Flying Grounds of the Royal Aero Club, and there were produced a series of biplanes with two engines, which were certainly the first multiple-engined aeroplanes in the world. At Eastchurch, Messrs. Short Bros. produced also the three "Short" biplanes on which the four officers first appointed by the Admiralty to the Royal Flying Corps, Naval Wing, were taught to fly.

In 1911, the firm took up the design of seaplanes with which they achieved almost immediate success, and in 1912 a seaplane of their design, piloted by Lieut. (now Colonel) Samson, R.N., rose from the deck of H.M.S. Hibernia, this being the first "heavier-than-air" machine of any kind to achieve this feat.

By the introduction of the "Short" Patent Folding Wing device, in 1913, the firm revolutionised the use of the seaplane, making it possible for seaplanes of large dimensions to be carried in H.M. ships for operations in all parts of the world. The device also brought about an immense saving in the cost of storage of both seaplanes and aeroplanes.

In 1913, finding further development necessary, the firm erected new works at Rochester, which were placed under the charge of Mr. H. O. Short, and devoted almost entirely to the manufacture of seaplanes.

The Short seaplane was the first, and is so far the only seaplane, employed successfully in a Naval Engagement (vide the following extract from an official letter to Messrs. Short Bros.):—

". . . the flight made by Flight Lieut. Rutland, with Assistant Paymaster Trewin, as observer, which Sir David Beatty praises so highly, was carried out on a 225-h.p. 'Short Seaplane' . . ."

Early in the war, a "Short" seaplane achieved the feat of carrying a torpedo into the air, and it has been officially announced that Flight Com. C. H. K. Edmonds, in a "Short" seaplane, succeeded in torpedoing a Turkish transport in the Sea of Marmora.

At the end of 1915, owing to the great development of their business, the firm found it necessary to establish an office in London, and from it the "business" side of their activities is mainly carried on. Mr. J. B. Parker, formerly Assistant-Paymaster, R.N., afterwards one of the best pilots of the R.N.A.S., was appointed to manage this office, having been previously invalided out of the Service before the war.

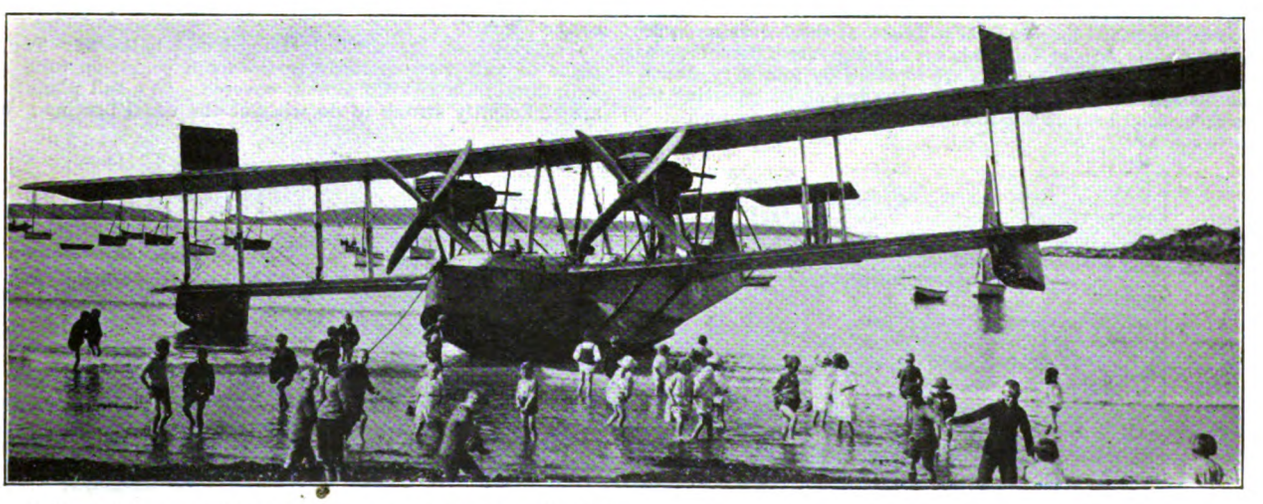
The firm sustained a grave loss in the death of Mr. Horace L. Short, the eldest of the three brothers, on the 6th April, 1917.

THE CROMARTY FLYING BOAT.

The Cromarty Flying Boat was originally designed for operating with the Fast Cruiser Squadron. This service necessitated its staying away from its base for long periods, consequently it possesses the following:—(a) Long range, i.e., big load capacity; and (b) great strength in order to be able to alight and rest in mid ocean.

These features make the machine specially suitable for commercial work, the former allowing for great variation in the load—range factor.

The latter feature is most important from the commercial point of view. The machine can not only take off and alight in rough water, but can safely be moored out in slightly protected harbours, thus economising greatly in shed accommodation, and particularly in labour for handling.



A Short "Cromarty" Boat on the Beach in the Scilly Isles.

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SHORT—continued.

It will be noticed that this machine is extraordinary for its large load capacity, which is shown in the following table :—

Range.	Duration.	Fuel per hour.	Economical speed.	Maximum commercial load.
270 mls.	3 hrs.	60 galls.	90 m.p.h.	*5,632 lbs.
540 mls.	6 hrs.	60 galls.	90 m.p.h.	3,796 lbs.
990 mls.	11 hrs.	60 galls.	90 m.p.h.	1,280 lbs.

*Crew of 3 only.

As a war machine it carries long-distance wireless, a big anti-submarine gun, and bombs.

The engines fitted are of the most reliable type, and the risk of engine failure is very small, provided proper care is taken.

Great attention is also being paid to the comfort of passengers : the passengers' compartment will be heated, the engines will be silenced as much as possible, and a good view will be provided.

Specification of the Short "Cromarty" Type Boat.

Span	**112 ft. (34 m. 10).**
Length	**60 ft. (18 m. 25).**
Height	**23 ft. (7 m.).**
Weight empty	**10,700 lbs. (4,815 kgs.).**
Weight loaded	**18,500 lbs. (8,325 kgs.).**
Disposable load	**7,800 lbs. (3,510 kgs.).**
Engines	**2 Rolls-Royce "Condor," 650 h.p.**
Full speed	**96 m.p.h. (153 km.h.).**
Economical speed	**90 m.p.h. (144 km.h.).**

(Scale Drawings of this machine were published in the 1919 edition of "All the World's Aircraft.")

THE ALL-METAL SHORT "SILVER STREAK."

Short Bros.' wide experience in the construction of rigid airships made them familiar with aluminium alloys, and when it became apparent that something more durable than wood and fabric was required in modern aircraft, they started experimenting on duralumin with a view to building with it complete machines as light and as strong as, and definitely more durable than, the present type.

The results have been extremely satisfactory and show that for equal weight a higher factor of safety can be obtained with duralumin than with a wooden structure.

The advantage of using non-inflammable material is apparent, and the known deficiencies of wood and fabric aeroplanes, such as distortion and deterioration due to climatic conditions, are obviated.

The construction generally lends itself to rapid production. Practically speaking, all the parts which comprise the making of a complete machine can be stamped out of sheet material.

The machine is completely built with duralumin with the exception of the wing spars, which are of steel tubing, and a few other minor parts in which it is found that steel is a more suitable material.

The machine is a single-seater single-engined tractor biplane, with "two-bay" wings, having been designed to carry mails or light freight to the amount of 400 lbs. If desired, space could be arranged to take two passengers in place of mails.

The fuselage is a metal shell, similar in construction to the wooden monocoque type, and is virtually a streamline duralumin tube suitably stiffened with bulkheads, rings and longitudinals. Where holes are cut in this shell the edge is stiffened by a roll of sheet duralumin. This structure has been thoroughly tested and has proved of sufficient strength to withstand the necessary tail loads.

It is built up of duralumin sheets of a reasonable thickness, riveted to oval channel-section formers of a somewhat heavier gauge of the same material. On the inside of the tube thus formed corrugated longitudinal stiffeners of sheet duralumin are riveted to the skin at intervals around the circumference. At the fore end, the oval formers are replaced by four very stoutly built box-section brackets, open at the top and supporting the two steel tube bearers whereon the engine rests. Immediately aft of this engine space a solid duralumin bulkhead closes off the engine from the rest of the fuselage.

Immediately under the bulkhead the steel tube front spar root is carried, and a second bulkhead farther aft serves to take and distribute the loads from the rear spar roots.

These two spar roots carry at their outboard ends a box rib of the same section as the wing proper. On the underside the lower half of the wing profile is carried right across the body, but on the upper surface is faired into the body lines in smooth curves.

The upper wing cabane of steel tubes springs from brackets on the upper part of the same two bulkheads as support the lower wing spar. This cabane is merely a pair of inverted "Vees," and carries the elementary centre section—consisting of one duralumin box rib and a pair of stub spar sockets.

Aft of the second of these two bulkheads is the pilot's cockpit. The furnishings of this provide an excellent example of the care expended in the design. Two half bulkheads sloping from the vertical, are riveted to the skin, with their upper edges united by a series of inverted trough section strips. These strips support the aluminium seat, with at each side a duralumin footboard. From the front of the first seat-carrying bulkhead a pair of metal angle beams run forward, forming on their upper faces a slide for the pilot's heel. At their fore end these two angles are coupled by a third much smaller partial diaphragm, whose central portion forms the rudder post support.

At the rear end of the fuselage bulkheads to support the front and rear spans of the tail plane and the rudder post are built in, and behind all an ogival tailpiece finishes off the lines of the body.

The wings are built on circular steel tubes of 50 ton steel. Circular steel tubes are admittedly not the lightest possible form of steel spar ; they are, as spars, probably heavier than wooden ones of equivalent strength, but in the first place the steel tube is readily obtainable, and in the second place the circular form reduces all spar fittings to turned steel work of the simplest nature, and a good deal of weight can be saved on these fittings, so that altogether there is little lost.

In this case for the interplane strut fittings a steel sleeve is slipped onto the spar and sweated in place. Sleeve and spar are drilled, and a steel tube bush is inserted into the hole. One eyebolt and a wiring plate complete the fitting. The drift struts within the wings are attached in a similar manner, the bracing between being of stranded cable.

Duralumin ribs, lightened with circular holes, slip onto the spars and are secured by small pins passing through flanges in the spar hole of the rib and the spar tube itself.

These ribs have no flanges—as have ribs for fabric-covered wings—instead they are deeper throughout the chord than is the wing profile proper, and the covering sheets of duralumin are flanged upwards at their edges. The turned-up edges of the covering strips butt against the projecting rib edges. The covering strips are of such width that one intervenes between each rib, and each rib has small tongues cut and turned down on alternate sides for the cover to rest on. Thus at each rib there is a ridge, consisting of the projecting portion of the rib with the flange of one cover sheet on each side. These are then capped by a trough section strip and the five thicknesses are riveted through from outside the wing.

Damaged covering strips can therefore be removed and replaced with no disturbance to any other part of the wings and special riveting tools are unnecessary.

Over that portion of the wing which carries ailerons the ribs terminate on a small diameter duralumin tube, somewhat aft the spar proper. Projecting past this tube are a number of stout duralumin box ribs, and the ailerons are hinged to these ribs, the hinge itself being carried back into recesses cut in the ailerons, which are thus balanced by the part projecting forward of the hinge.

The elevators are similarly hinged and balanced. The tail plane is built very similarly to the main wings, on tube spars with duralumin ribs duralumin covered. The tail plane spars are sufficiently strong to do without the usual bracing ; there

The Short All-Metal "Silver Streak."

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SHORT—*continued.*

is, however, a bracing from the lower side of the fuselage to very close in on the tail spars. This is really a method of widening the base to which the spars are attached, as the fuselage is here quite narrow.

The undercarriage is of the steel tube Vee type attached to the lower wing spar roots, fitted with an undivided axle which is sprung on rubber in the usual way. In addition, there is built into the base of each Vee an oil dashpot with a plunger attached to the axle, which forms an anti-bouncing snubber.

The whole of the exposed wiring is carried out in twin stranded cable, the ends thereof fitted with the "Short" cable terminal. which serves the purpose of both strainer and cable end, and presents a much lower head resistance than the usual splice and turnbuckle.

The "Silver Streak" has for some time been in the hands of the R.A.E. at Farnborough for experimental purposes. Flying tests have shown it to possess a really excellent performance, and an extensive series of mechanical tests have proved the structure to possess the necessary strength, together with an extraordinary resistance to long-continued vibrations of a magnitude quite beyond those due to normal use.

The satisfactory result of these tests has been demonstrated by a definite order on the part of the Air Ministry for two further machines embodying the same type of construction.

Specification of the Short "Silver Streak."

Engine type and h.p.	**Siddeley "Puma."**
B.H.P.	**240.**
Surface	**370 sq. ft.**
Span	**37 ft. 6 in.**
Chord	**5 ft. 3 in.**
Gap	**5 ft.**
Length overall	**26 ft. 5 in.**
Height	**10 ft. 6 in.**
Petrol Tank capacity	**50 galls.**
Oil Tank capacity	**6 galls.**
Total weight	**2870 lbs.**
Weight empty	**1865 lbs.**
Fuel and oil	**425 lbs.**
Crew	**180 lbs.**
Useful load	**400 lbs.**
Lbs. per h.p.	**11.**
Lbs. per sq. ft.	**7.86.**
Speed.	
Maximum	**120 m.p.h.**
Cruising	**90 m.p.h.**
Range.	
At full power	**360 miles.**
At cruising speed	**450 miles.**
Endurance.	
Full power	**3 hours.**
Cruising speed	**5 hours.**
Climb.	
To 10,000 feet	11 mins.

THE SHORT "SPRINGBOK" TWO-SEAT FIGHTER.

Short Bros. have recently built, for the Air Ministry, all-metal two-seater fighters fitted with the Bristol "Jupiter" engine of 400 h.p. These are known as the "Springbok."

These machines are generally of the construction of the "Silver Streak," above described, and their general arrangement is indicated in the accompanying illustrations.

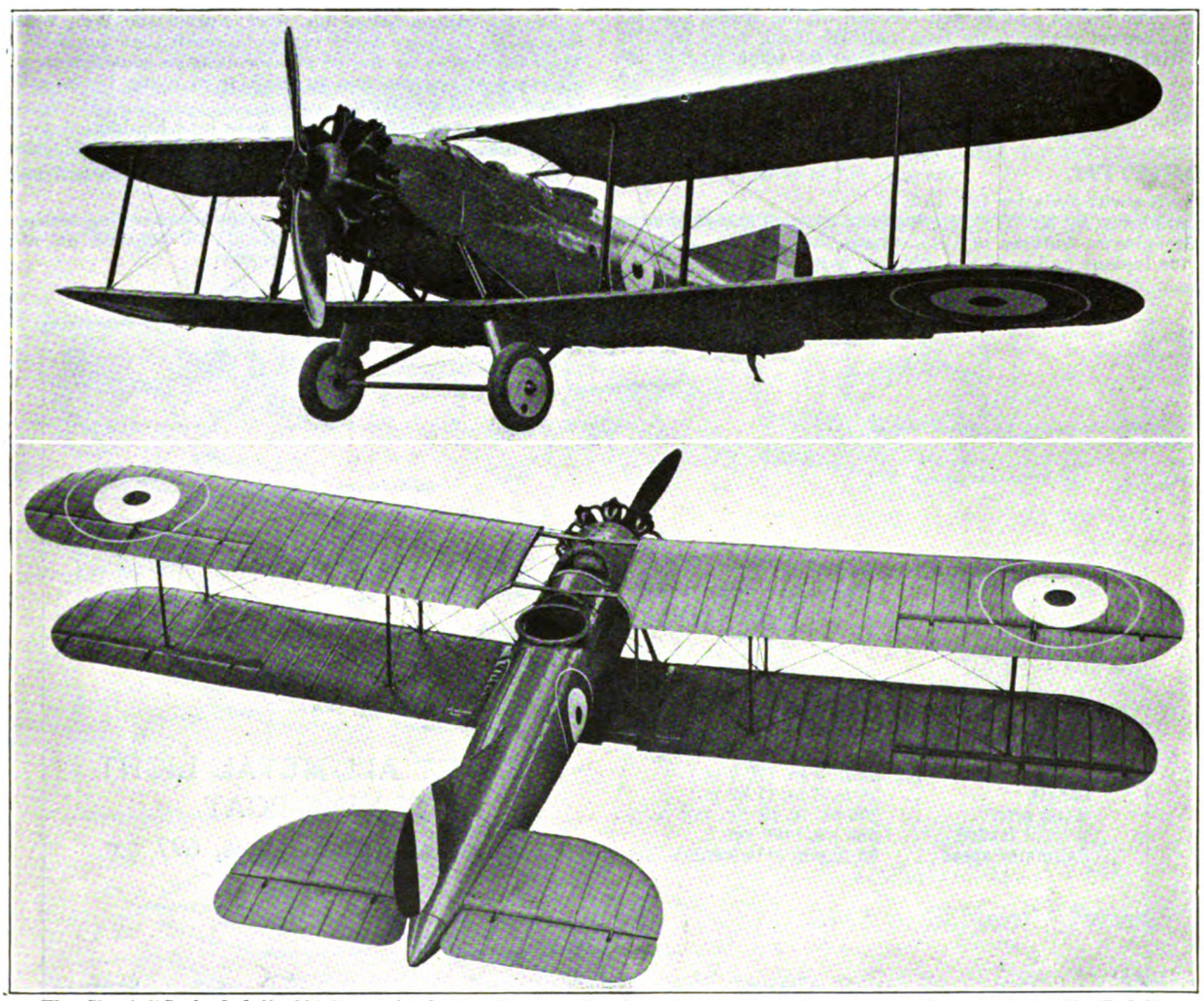
No information of a detailed nature can, however, be published concerning these machines.

THE SHORT ALL-METAL LIGHT FLYING-BOAT.

Late in 1923 Short Bros. put in hand a small all-metal single-seat flying-boat to the order of Mr. Lebbaeus Herdern, of Sydney. This machine is fitted with two Blackburne Vee twin engines, each of 697 c.c. cylinder capacity, mounted on the wings, driving tractor airscrews by extended shafts.

The machine is a monoplane with wings braced from the chine of the hull to just outside the engine mounting and is built on principles similar to those employed in the "Silver Streak" and the "Springbok."

The wing spars and bracing struts are of 50-ton steel tube, the remainder of the structure is of duralumin.



The Short "Springbok" (400 h.p. Bristol "Jupiter"). The first all-metal aeroplane to have been built for the R.A.F.

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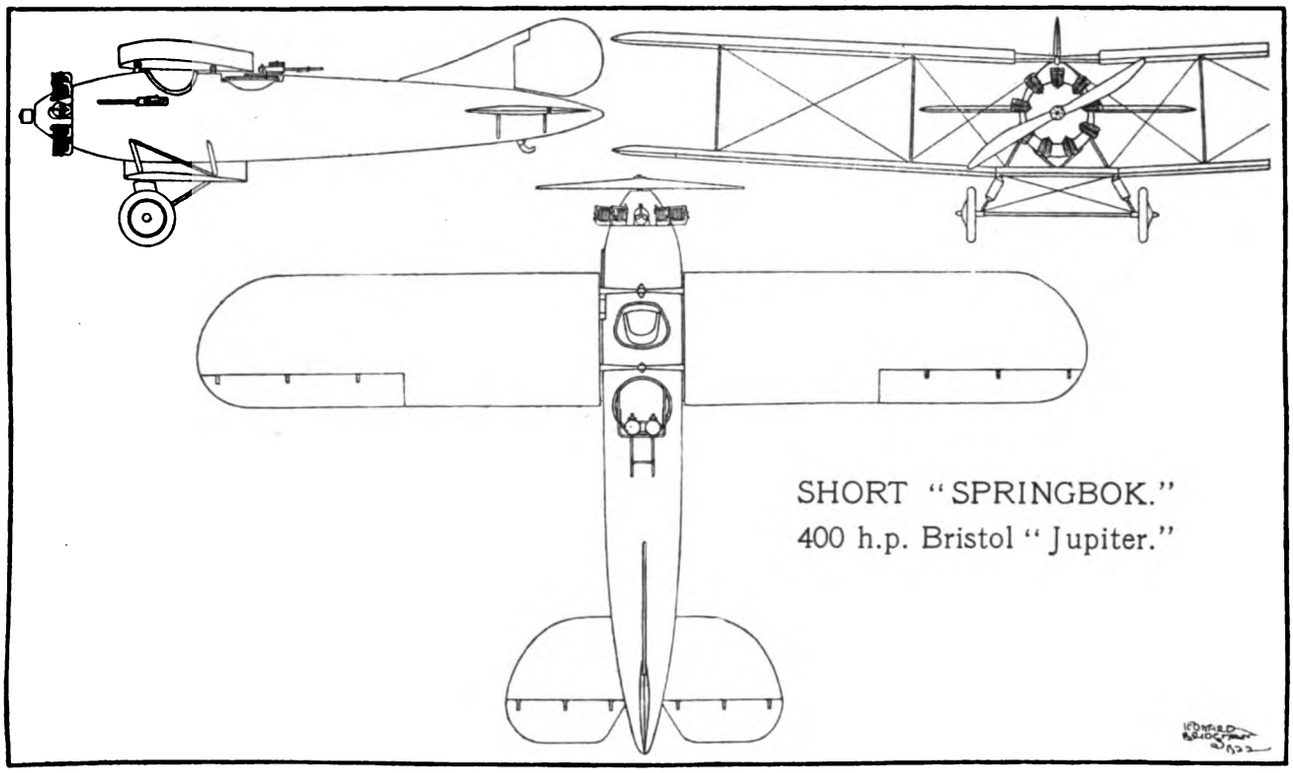


The hull has a wide planing surface at the bottom and a marked "tumble home" on the sides and is of the two-step type. The pilot's seat is well forward of the wings and the engines are set rather more than half-way back from front to rear wing-spars. Ailerons are fitted over the whole span of the wings.

A general arrangement drawing gives an excellent idea of the machine.

SOPWITH.

The Sopwith Aviation Co., Ltd.

Established by Mr. T. O. M. Sopwith, the well-known aviator, at Brooklands, Autumn of 1911, where, during 1912, a 70 h.p. tractor biplane and a 40 h.p. biplane were turned out.

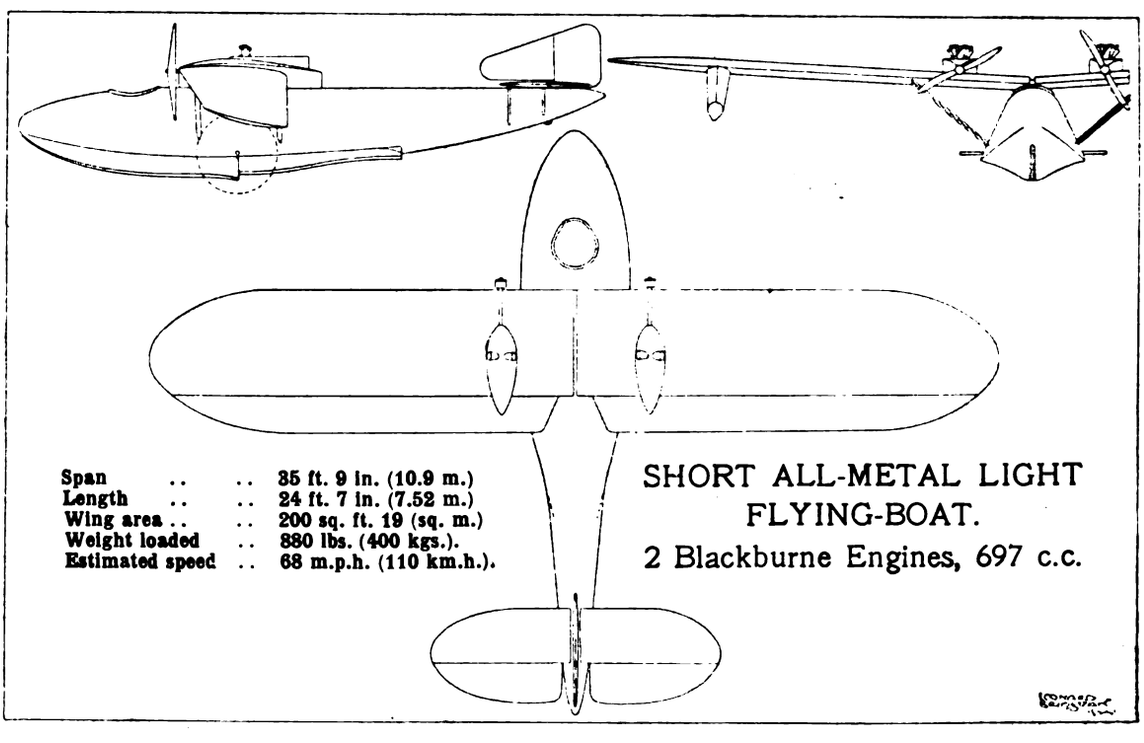
The Company became a private limited company. Directors: T. O. M. Sopwith, C.B.E., M. G. Sopwith, R. O. Cary.

The Sopwith Aviation Co. were, during the War, probably responsible for more divers types of aircraft than any other firm. Their experience as that of pioneer designer-constructors covers all types of heavier-than-air craft from flying boats and sea-planes to land machines.

In September, 1920, the firm went into liquidation owing to heavy losses incurred in attempting to make motor bicycles.

Late in 1922 it was announced that the firm had paid its liabilities in full.

Mr. Sopwith is now interested in the Hawker Engineering Co., Ltd., (which see) and this firm is now engaged on aircraft productions.


Span .. .. 35 ft. 9 in. (10.9 m.)
Length .. .. 24 ft. 7 in. (7.52 m.)
Wing area .. .. 200 sq. ft. 19 (sq. m.)
Weight loaded .. 880 lbs. (400 kgs.).
Estimated speed .. 68 m.p.h. (110 km.h.).
SHORT ALL-METAL LIGHT FLYING-BOAT.
2 Blackburne Engines, 697 c.c.

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SUPERMARINE.

The Supermarine Aviation Works, Ltd.

Registered offices and works: Southampton. Flying water and slipways: Woolston.

London office: Broadway Court, Broadway, Westminster, S.W.1.

Designers of the *Supermarine* flying boats and amphibian flying boats. Founded in 1912, by Mr. Noel Pemberton Billing, then known as a pioneer of aviation, and as a motorist and yachtsman.

Before the war, he built some very interesting experimental flying-boats, some of which were ordered by Germany before the war, but were not delivered.

The Supermarine Works worked during the war on Admiralty designs, but built some experimental machines.

The name of the firm was changed during the war from Pemberton Billing, Ltd., to The Supermarine Aviation Works, Ltd., and Squadron-Commander Pemberton Billing ceased to have any connection with it. The firm then came under the control of Mr. Hubert Scott-Paine.

In November, 1923, Commander J. Bird acquired the whole of the interests of the Supermarine Aviation Works, Ltd., and formed a new Board of Directors.

Mr. H. Scott-Paine retired in order to take over the British Marine Air Navigation Co., Ltd., and to devote the whole of his activities to Marine Civil Air Transport.

The Directors are: G. L. Wood, James Bird, James Dickinson, H. Leigh Mossley.

The Head Designer of the firm is: R. J. Mitchell.

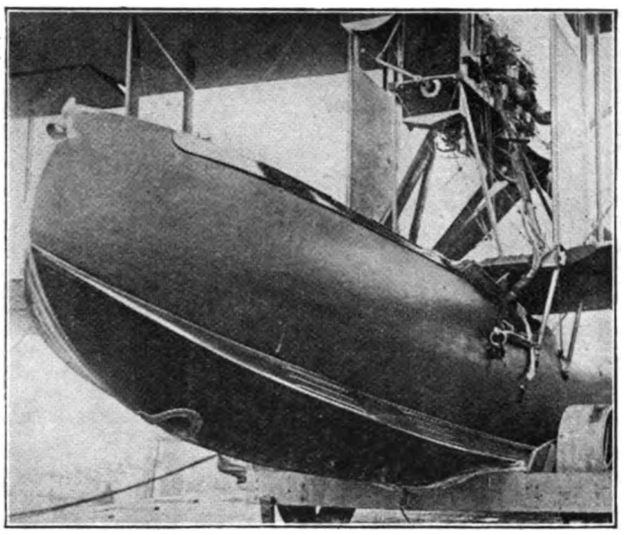
The firm has of late been devoted chiefly to the construction of flying-boats of various types, all with marked success.

Since the War, the firm has been very successful with new types of service, racing and commercial flying-boats.

THE SUPERMARINE DUAL CONTROL TRAINING AND SCHOOL TYPE.

This machine is a single-engined flying-boat, specially designed as a dual control naval training and school machine. It is especially suited to this purpose, having a low landing speed, being exceptionally easy to handle both in the air and on the water, and being built very sturdily to stand the rough usage to which a training machine is always put. The machine is very sea-worthy, and has been tested and tried out during the most varying weather conditions with highly satisfactory results.

Three types of this machine have been standardised, viz., two-seater fighter, three-seater school machine, and a four-seater passenger machine, which has been tested and tried out during the most varying weather conditions with highly satisfactory results.



A Supermarine "Training" type fitted for photographic survey work. The view shows the port for the camera fitted to the hull bottom.

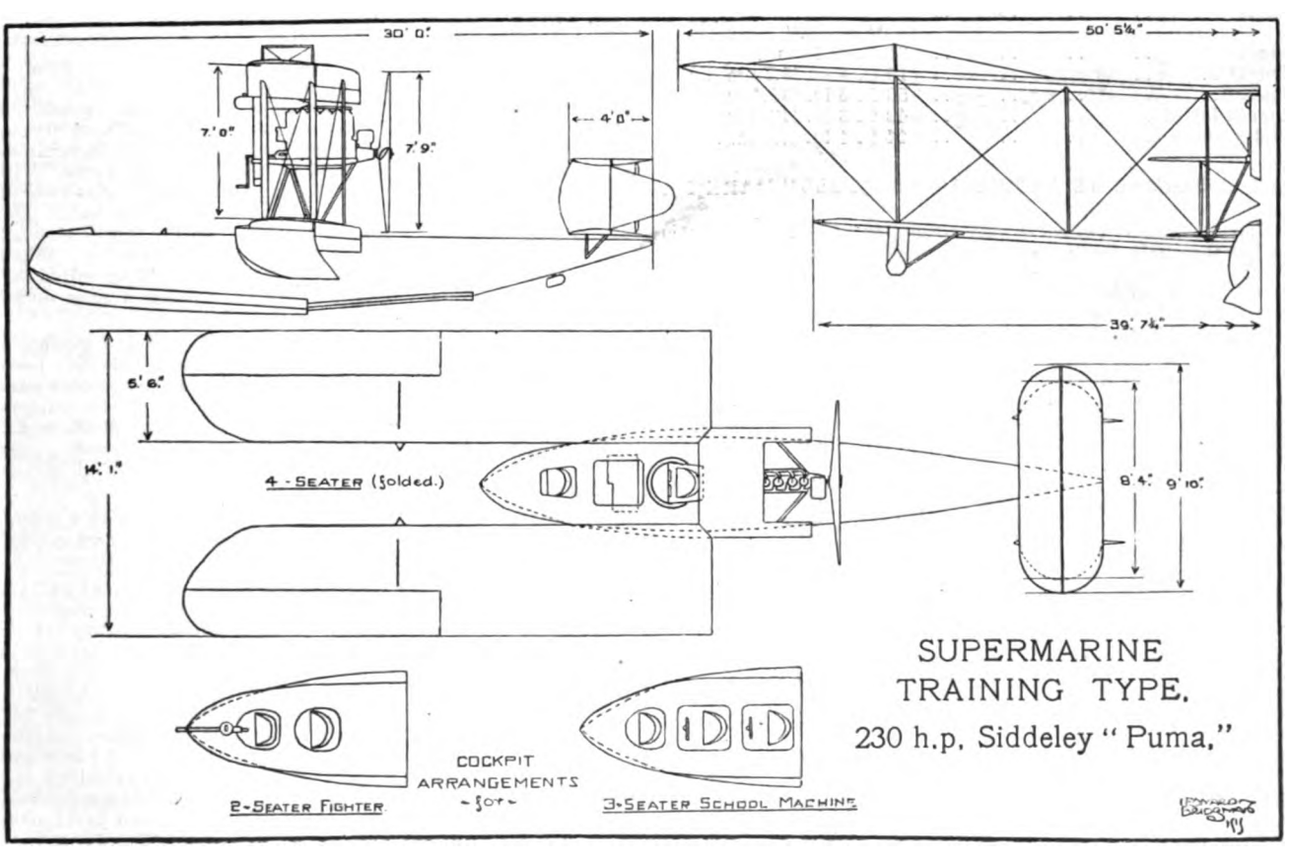
As a school machine it is arranged to carry two pupils at a time—one at the dual control actually learning to fly, and the second as a spectator of his efforts, thus gaining experience of being in the air and a notion of what is expected of him later.

As a four-seater passenger machine it is claimed that this is one of the most serviceable commercial machines in the world. It carries 540 lbs. of useful load for a consumption of one gallon of petrol to every eight miles.

The "Channel" type is in use by the Norwegian and Japanese Governments as a naval training machine, and fitted with adequate armament, is used as a fighter observer machine by a number of foreign Governments.

A machine of this type was used to demonstrate to representatives of the Port of London Authority, the Trinity Brethren, and the Scotland Yard that a flying boat could be handled in a busy waterway, and that it was possible to use the Thames as an air port.

Boats of this type can be equipped for all types of special purposes, as instance the machine shown in an attached photograph, which has been specially fitted for the photographic survey of the delta of the Orinoco.



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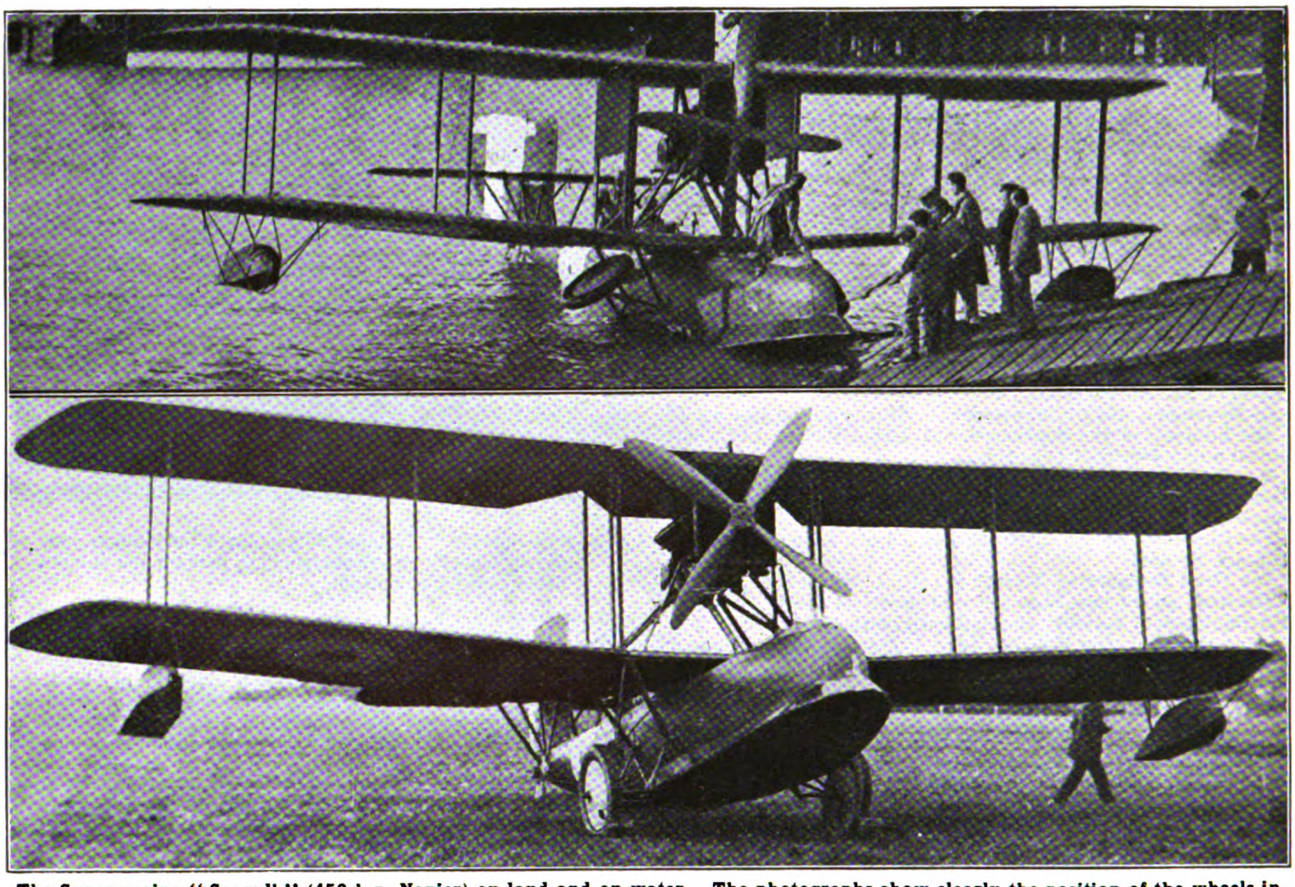

The Supermarine "Seagull" (450 h.p. Napier) on land and on water. The photographs show clearly the position of the wheels in both the landing and the sea-going positions.

Specification.

Weight fully loaded	**3,700 lbs. (1,680 kgs.).**
Weight light	**2,620 lbs. (1,190 kgs.).**
Wing loading	**8.2 lbs./sq. ft. (40 kgs./sq. m.).**
Power loading	**15.4 lbs./h.p. (7 kgs./h.p.).**
Engine	**240 h.p. Siddeley "Puma."**
Length	**31 ft. (9.45 m.).**
Height	**15 ft. 6 in. (4.72 m.).**
Span	**50 ft. 6 in. (15.4 m.).**
Length folded	**42 ft. 3 in. (12.8 m.).**
Width folded	**14 ft. 1 in. (4.3 m.).**

THE SUPERMARINE AMPHIBIAN "SEAGULL" MARK III.

The machine depicted in the accompanying illustrations is one of the most recent products of the Supermarine Aviation Works, Ltd., and has been built for the Royal Air Force as a deck landing amphibian for Fleet "spotting" purposes.

The special requirements for a machine of this type are the lowest possible landing speed combined with a high degree of manœuvrability at that speed, in order to permit landing on the deck of a seaplane carrier, combined with a very high degree of seaworthiness when used as a seaplane. The results of many tests with this particular machine demonstrate that these requirements and many others have been amply met by the "Seagull."

Generally, the design of the machine follows standard Supermarine practice. The hull is of the well-known Supermarine circular construction, combining in a high degree the requisites of strength, lightness and resiliency. This hull is fitted with one cockpit right forward for the pilot, and a second, well aft the wings, accommodating in tandem observer and rear gunner, together with all such equipment as is required for their use.

The biplane wings, which are equal in span, are of normal construction. They are mounted above the hull, and consist of a central section which supports the whole power plant, together with two outer sections, one on each side. These are arranged to fold backwards, as is usual in machines designed for such purposes.

The upper wing is flat from end to end, the lower wing has an appreciable dihedral, and carries at its outer extremities a pair of wing-tip floats. Ailerons are fitted to both upper and lower wings.

At the rear end of the hull is mounted the tail unit. This consists of a monoplane tail, of the inverted wing section type, which is braced to the hull by steel tube stays running out to about one-third of the half span on each side. The tail is therefore largely overhung and there is little bracing to restrict the field of fire from the aft gun.

In addition there is a large fin and a balanced rudder, together with a small water rudder beneath the hull.

The wheeled undercarriage, is arranged in such a manner that no landing loads are imposed on the hull structure when the wheels are in use. The loads on the wheels are transmitted through a nearly vertical telescopic strut furnished with shock-absorbers, to the lower wing centre section front spar, immediately under the centre section and engine mounting struts. The wheel axle is carried by a projecting triangulated structure of steel tubes hinged to two points on each side of the hull. The nearly vertical strut is movable. When in its nearly vertical position, it maintains the wheels in position for landing. When the top end is withdrawn inboard, the wheels fold up round the hinges on the hull side and take up their position close under the wings and well clear of the water.

The engine is the Napier of 450 h.p. The engine mounting is unusual in that it is of the tractor type. This has been rendered possible by the fact that in this case the greater part of the useful load carried is aft of the wings in the tandem cockpits, and the success of the tractor mounting will allow this type of boat to be arranged either as a tractor in such a case as this or as pusher in cases where the greatest useful load is concentrated forward.

Very great attention has been paid in designing this engine installation to securing accessibility for inspection and adjustment of the engines and its accessories.

The "Seagull" Mark III is a development of Marks I and II, and is a great improvement upon them. The chief alteration is the carrying of all the petrol in tanks under the top centre section plane, and thus feeding the engine by direct gravity. By thus removing the petrol from the hull, a through passage is obtained between the gunner and observer and the pilot. The establishing of direct communication between the crew has very considerably increased the operating efficiency of the machine. The carrying of the petrol tanks in the top plane and the installation of gravity feed very considerably simplifies the design, and the "Seagull" Mark III was the first single-engined flying-boat to be thus fitted. Main dimensions and particulars of the machine are as follows :—

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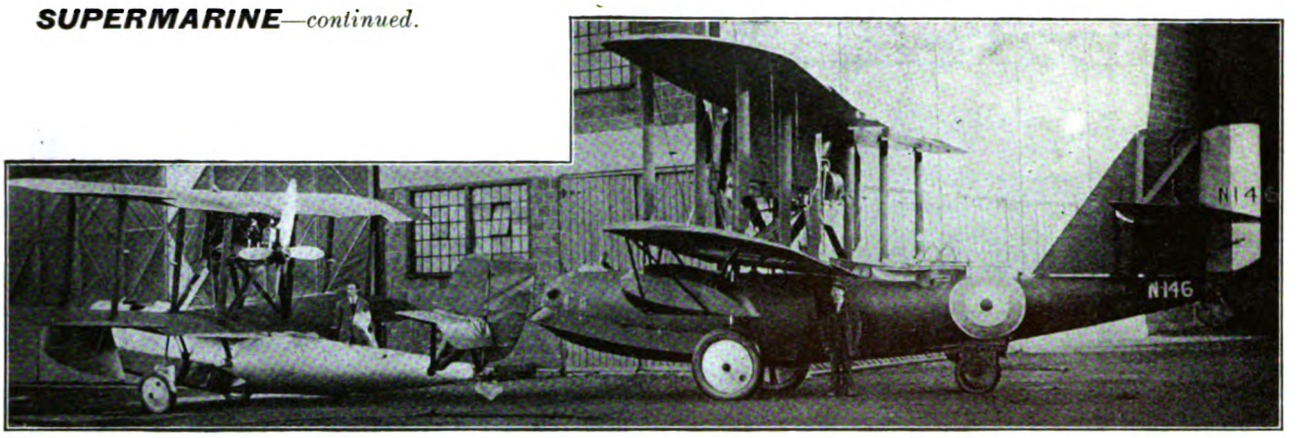
SUPERMARINE—*continued.*



On the left is the Supermarine single-seat fighter, "Sea King III." The large machine to the right is the fleet spotter "Seagull Mk. III."

Weight fully loaded	**5,860 lbs. (2,620 kgs.).**
Weight light	**4,000 lbs. (1,813 kgs.).**
Wing loading	**9.46 lbs./sq. ft. (46 kgs./sq. m.).**
Power loading	**12.5 lbs./h.p. (5.7 kgs./h.p.).**
Engine	**450 h.p. Napier "Lion."**
Length	**37 ft. 0 in. (11.3 m.).**
Height	**15 ft. 8 in. (4.82 m.).**
Span	**46 ft. 0 in. (14.0 m.).**
Width	**17 ft. 6 in. (5.37 m.).**
Max. speed	**108 m.p.h. (175 km.h.).**
Landing speed	**44 m.p.h. (71 km.h.).**
Climb to 5,000 ft. (1,520 m.)	**11 mins.**

THE SUPERMARINE "SEA LION" MARK III.

This single-seater amphibian flying-boat has been designed as a high performance fighting scout, specially adapted for getting off gun-turret platforms of capital ships, or getting off and landing on the decks of aircraft carriers.

The strength and design of the hull are such that it can operate on and from the water under any weather conditions in which it would be possible to operate any other sea craft of equal size.

The manœuvrability of the "Sea Lion" Mark III is one of its most important features. It can be looped, rolled, spun, and stunted in every possible way.

Longitudinally, the machine is neutral, and flying at any speed throughout its entire range either with engine on, gliding, or climbing, no load is felt on the control stick. This balance has been obtained entirely on the stabilising surfaces, and no mechanical adjustment by the pilot is required.

The hull is of circular construction with built-on steps, which can be replaced in case of damage. The steps are divided into watertight compartments, the top side being of single-skin planking, covered with fabric treated with a tropical doping scheme. The form of hull is clearly shown in the scale drawing.

The engine is mounted in a stream-line nacelle, which contains oil tank, radiator and shutters, piping, controls, etc. The whole unit is very accessible and the engine can be replaced very easily.

Interchangeability and ease of upkeep and repair have been carefully studied. The complete wing structure, including power unit, can be removed from the hull by withdrawing eight bolts. The wing structure consists of top and bottom centre sections, and top and bottom planes of equal span. One set of struts are carried on either side of the centre section. The top planes have a dihedral angle of 1½° and the bottom planes one of 3½°. The engine unit is carried on two sets of inwardly inclined N struts, and can be removed and replaced without interfering with any wing structure member.

The petrol supply is by pressure, and every effort has been made to reduce the length of piping and eliminate as much as possible the carrying of piping into the hull.

The amphibian undercarriage, which can be removed by the undoing of ten bolts in all, folds up under the wings, and when folded is well clear of the water. It is raised and lowered by a worm and bevel gear.

The pilot's cockpit is in the nose of the boat and gives an almost unobstructed view in every direction. The equipment consists of a complete set of instruments, anchor and cable, bilge pump, towing fairleads and make-fast cleats, boathook, engine and cockpit covers, towing bridle and lifting slings, "Pyrene" fire-extinguisher, Lewis gun and six double trays of ammunition.

The tail-unit consists of fin and rudder of ample dimensions and a monoplane tail plane with reversed camber.

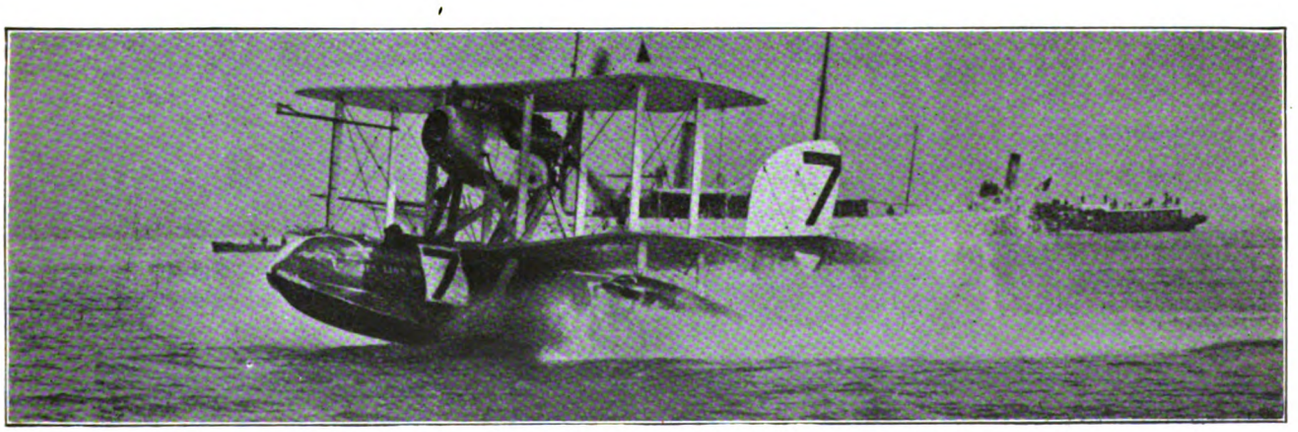
The steerable tail skid is carried under the extreme end of the hull.

The machine can be fitted with 300 h.p. Hispano-Suiza engine or 450 h.p. Napier "Lion."

The "Sea Lion" Mark III is a development of the "Sea King" and "Sea Lions" Mark I and II. It was the "Sea Lion" Mark II which won the Schneider Cup Race at Naples, in August, 1922, at an average speed of 146 m.p.h. and set up World's Speed records for flying-boats.

The fact that the machine was in all essentials a standard type suitable for ordinary service duties, but was, nevertheless, able to defeat the specially designed racing machines with which it had to contend, is a very great tribute to the excellence of Supermarine design.

The "Sea Lion" Mark III was third in the Schneider Cup Race, 1923, and completed the triangular course at an average speed of 157 m.p.h. For this race the machine was generally cleaned up in design, but was still a service type machine and by no means a specially designed racing machine. The maximum speed over a straight course is 175 m.p.h.



The Supermarine "Sea Lion" as she appeared at the 1923 Race for the Schneider Cup.

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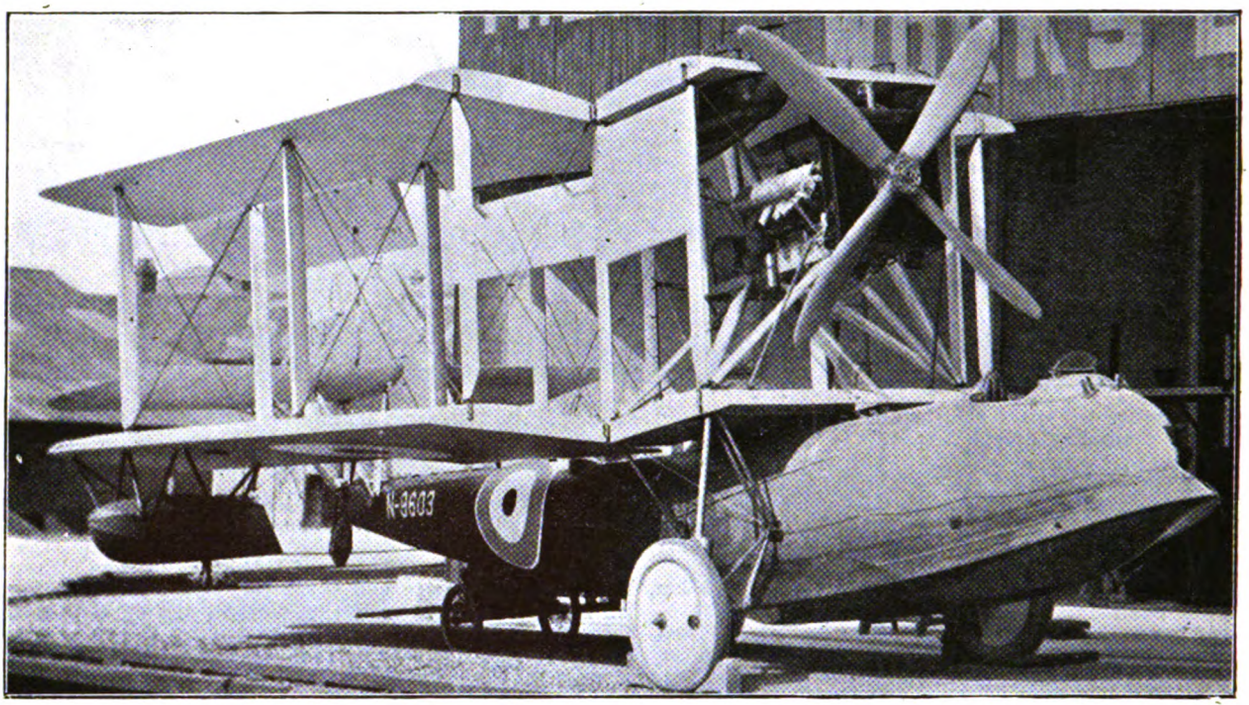
SUPERMARINE—*continued.*



The Supermarine "Seagull" (Napier "Lion" engine).

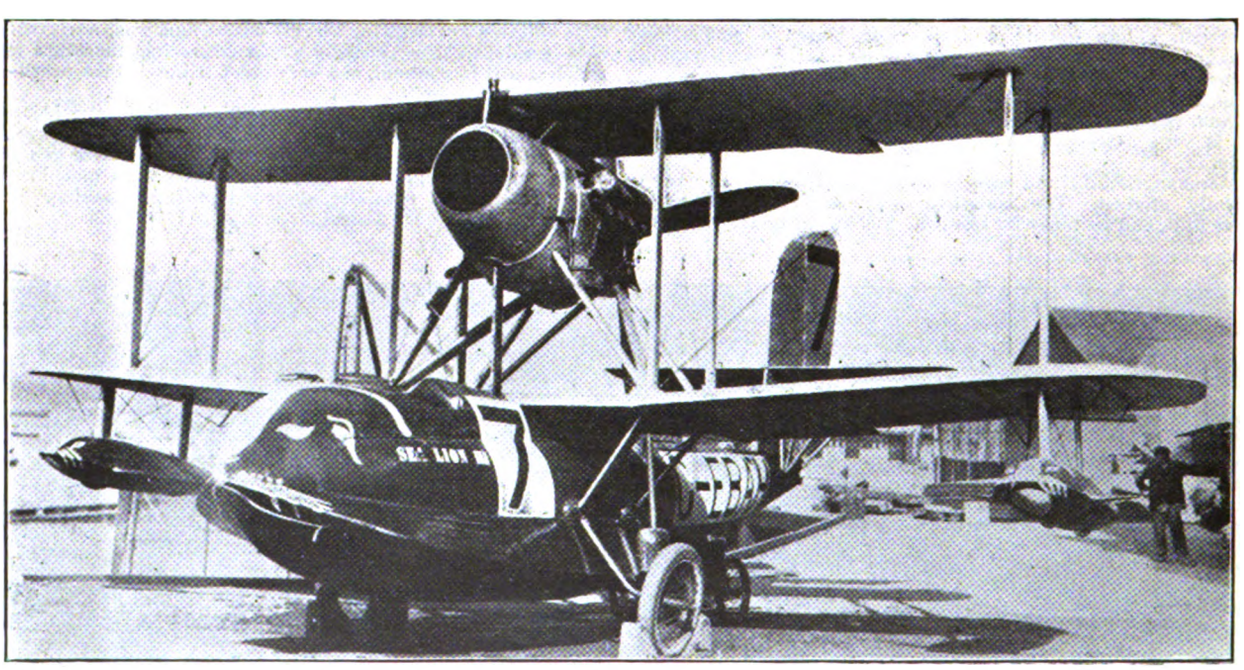
Main particulars of "Sea Lion" Mk. III as Amphibian Fighting Scout fitted with Napier "Lion" Engine.	
Weight loaded	3,275 lbs. (1,487 kgs.).
Weight empty	2,400 lbs. (1,090 kgs.).
Wing loading	9.4 lbs./sq. ft. (46 kgs./sq. m.).
Power loading	6.8 lbs./h.p. (3.1 kgs./h.p).
Engine	450 h.p. Napier "Lion."
Length	27 ft. 6 in. (8.38 m.).
Height	12 ft. 0 in. (3.66 m.).
Span	32 ft. 0 in. (9.76 m.).
Max. speed	155 m.p.h. (250 km.h.).
Cruising speed	125 m.p.h. (200 km.h.).
Landing speed	55 m.p.h. (89 km.h.).
Climb to 10,000 ft. (3,040 m.)	7 mins.
Ceiling	23,500 ft. (7,160 m.).

THE SUPERMARINE "SEA EAGLE."

This machine was specially designed as a commercial amphibian flying-boat for passenger carrying work. It carries six passengers and pilot, with fuel for a distance of 230 miles. Extra tankage is fitted so that the range can be increased by reducing the number of passengers.

The passengers are accommodated in a roomy cabin in the forepart of the hull. This cabin is very comfortably fitted out. Its position in front of the engine makes it very quiet and free from engine exhaust gases, oil, etc. It is very efficiently heated and ventilated, and is fitted with sliding triplex windows along the two sides for use in the warm weather.

The machine is very strongly built and very seaworthy, and has proved itself quite safe in the roughest of seas usually



The "Sea Lion" as arranged for the Schneider Cup Race, 1923.

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SUPERMARINE—*continued.*

The Supermarine "Sea Eagle" Rolls-Royce (Eagle IX.)

experienced in the Channel. It is fitted with a Rolls-Royce "Eagle IX" engine of 360 h.p.

The machine is being used most successfully by the British Marine Air Navigation Co. on their service from Southampton to the Channel Islands.

The following are the main particulars of the machine :—

Specification of the "Sea Eagle."

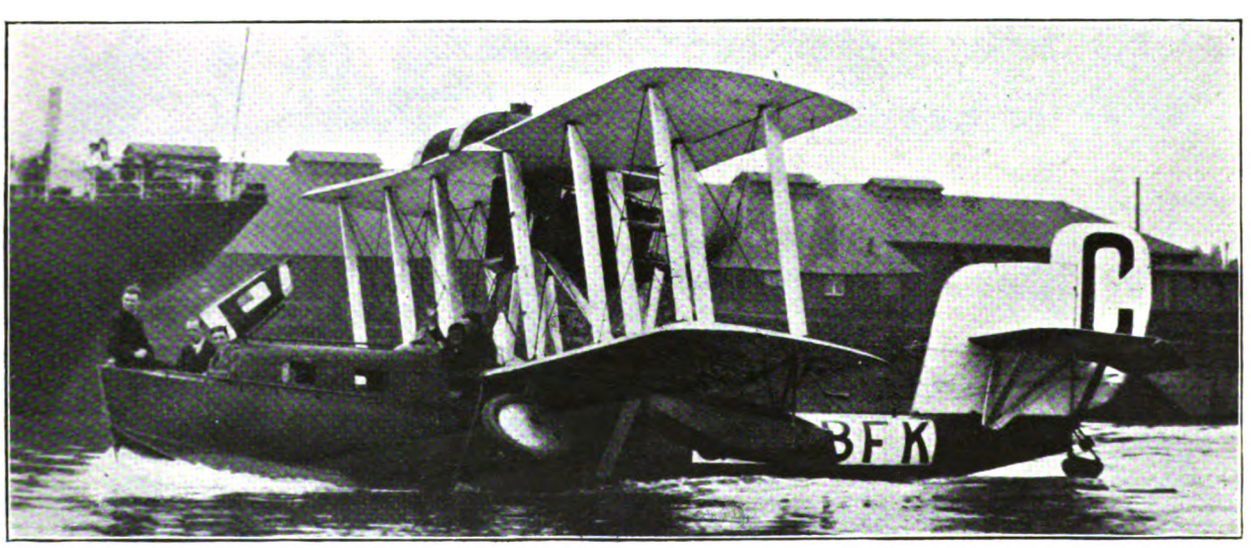
Weight fully loaded	**6,050 lbs. (2,750 kgs.).**
Weight light	**3,950 lbs. (1,790 kgs.).**
Wing loading	**9.75 lbs./sq. ft. (47.5 kgs./sq. m.).**
Power loading	**16.3 lbs./h.p. (7.4 kgs./h.p.).**
Engine	**360 h.p. Rolls-Royce "Eagle IX."**
Length	**37 ft. 4 in. (11.4 m.).**
Height	**15 ft. 11 in. (4.76 m.).**
Span	**46 ft. 0 in. (14 m.).**
Length folded	**43 ft. 0 in. (13.1 m.).**
Width folded	**21 ft. 1 in. (6.45 m.).**
Maximum speed	**93 m.p.h. (150 km.h.).**
Cruising speed	**84 m.p.h. (130 km.h.).**
Landing speed	**50 m.p.h. (82 km.h.).**
Climb to 5,000 ft. (1,640 m.)	**20 mins.**

THE SUPERMARINE TWIN-ENGINED AMPHIBIAN.

This is a passenger-carrying amphibian flying-boat, fitted with two Rolls-Royce "Eagle IX" engines, and carries 12 passengers with luggage, together with a crew of two, complete navigating equipment and fuel for 300 miles. This is the first twin-engine amphibian flying-boat to be built in the world. The folding of the chassis is operated by a wind-driven fan, which can be reversed or thrown into neutral at will by the pilot, for raising or lowering the chassis. For operating of the chassis when on the water, a hand gear is fitted.

An important feature of this machine is that the whole of the hull is occupied by passenger's accommodation. There are no internal obstructions whatever, such as ties, cross beams, and no controls, pipes, etc., are taken inside the hull. The internal accommodation consists of one large passenger saloon, elaborately furnished and upholstered, and with every possible comfort. Forward of the saloon is the luggage compartment, fitted with racks for the stowage of passengers' baggage, etc. This compartment is partitioned off from the passengers' saloon. Aft of the saloon is the buffet, with all necessary fittings to supply light refreshment during the journey. Still further aft are the lavatories, which are efficiently and fully equipped.

The pilot and navigator are accommodated in a cabin specially built on the top of the hull. In this position they are given an



The Supermarine Sea Eagle taxying.

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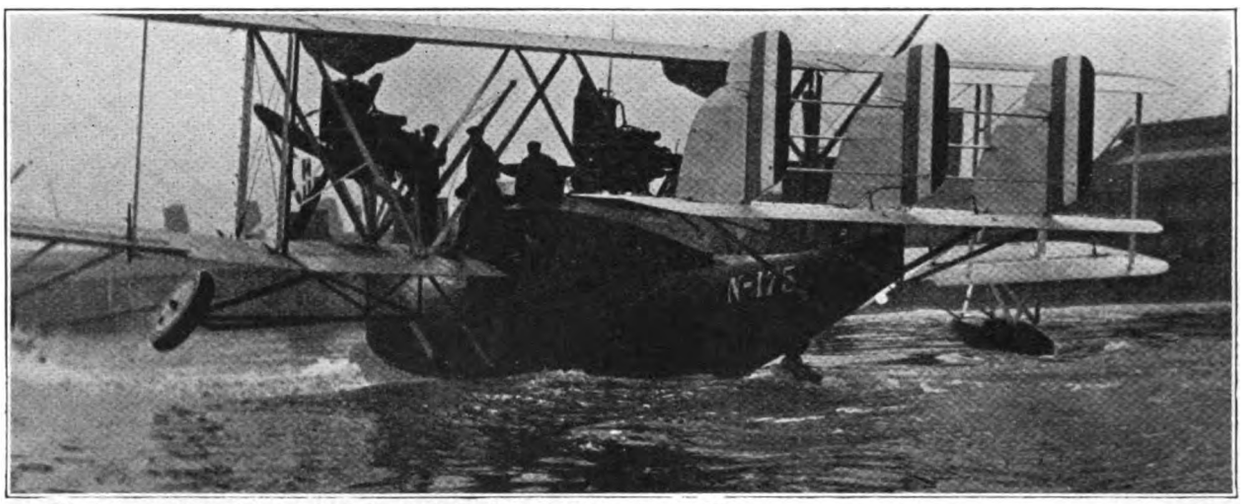
SUPERMARINE—*continued.*

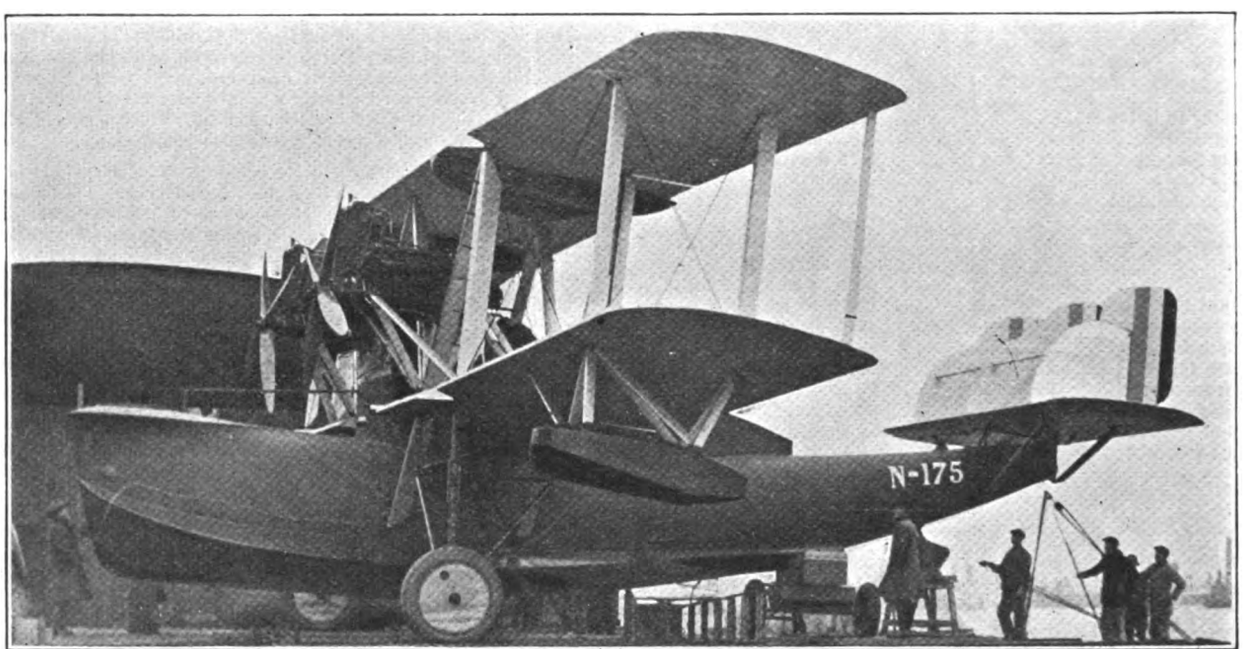


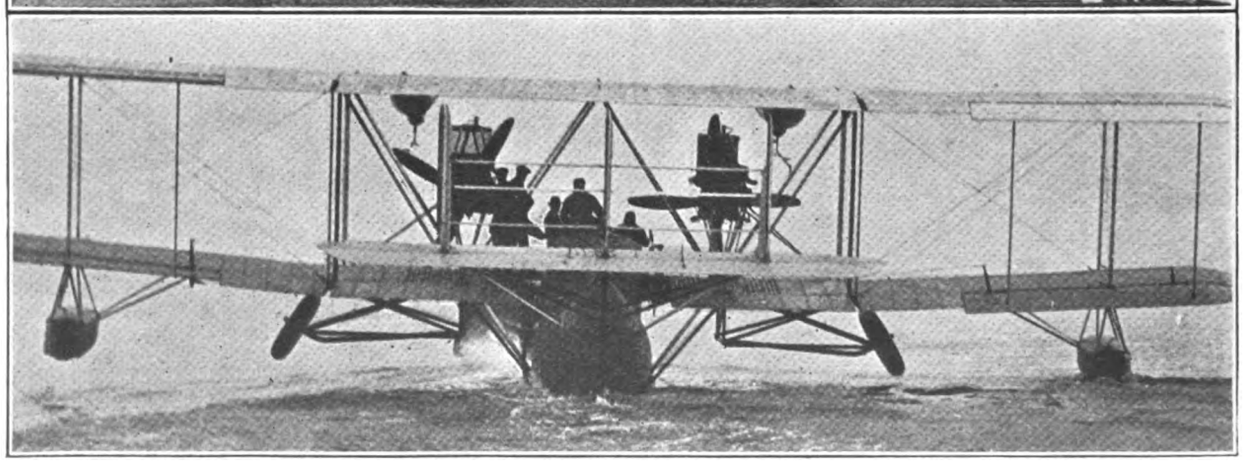
The Supermarine Twin-engined Amphibian (2 Rolls-Royce Eagle IX's).

extremely good view in all directions, and are in a fine position for starting up engines, handling the machine on the water, and for operating the craft under all conditions. The main particulars of the machine are as follows :—

Weight fully loaded	**11,900 lbs. (5,420 kgs.).**
Weight light	**7,800 lbs. (3,550 kgs.).**
Wing loading	**9.3 lbs./sq. ft. (45.5 kgs./sq. m.).**
Power loading	**16 lbs./h.p. (7.5 kgs./h.p.).**
Engines	**2—360 h.p. Rolls-Royce "Eagle IX's."**
Length	**49 ft. 2 in. (14.9m.).**
Height	**20 ft. 9 in. (6.37 m.).**
Span	**69 ft. 0 in. (21 m.).**
Length folded	**56 ft. 0 in. (17.1 m.).**
Height folded	**26 ft. 1 in. (7.68 m.).**
Width folded	**43 ft. 9 in. (13.4 m.).**
Maximum speed	**92 m.p.h. (148 km.h.).**
Cruising speed	**83 m.p.h. (134 km.h.).**
Landing speed	**45 m.p.h. (73 km.h.).**
Climb to 5,000 ft. (1,640 m.)	**18 mins.**

A later model, with two 450 h.p. Napier "Lion" engines, has been tested. This machine is known as the "Swan."





The three photographs show a recent product of the Supermarine Aviation Works Ltd.,—the first amphibian flying boat to be built with twin engines (Rolls-Royce Eagle IX's.).

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VICKERS.

V

The "Viking" Mark III (Napier engine) which won the Air Ministry Competition, 1920.

Vickers Ltd., Vickers House, Broadway, Westminster, S.W.1.

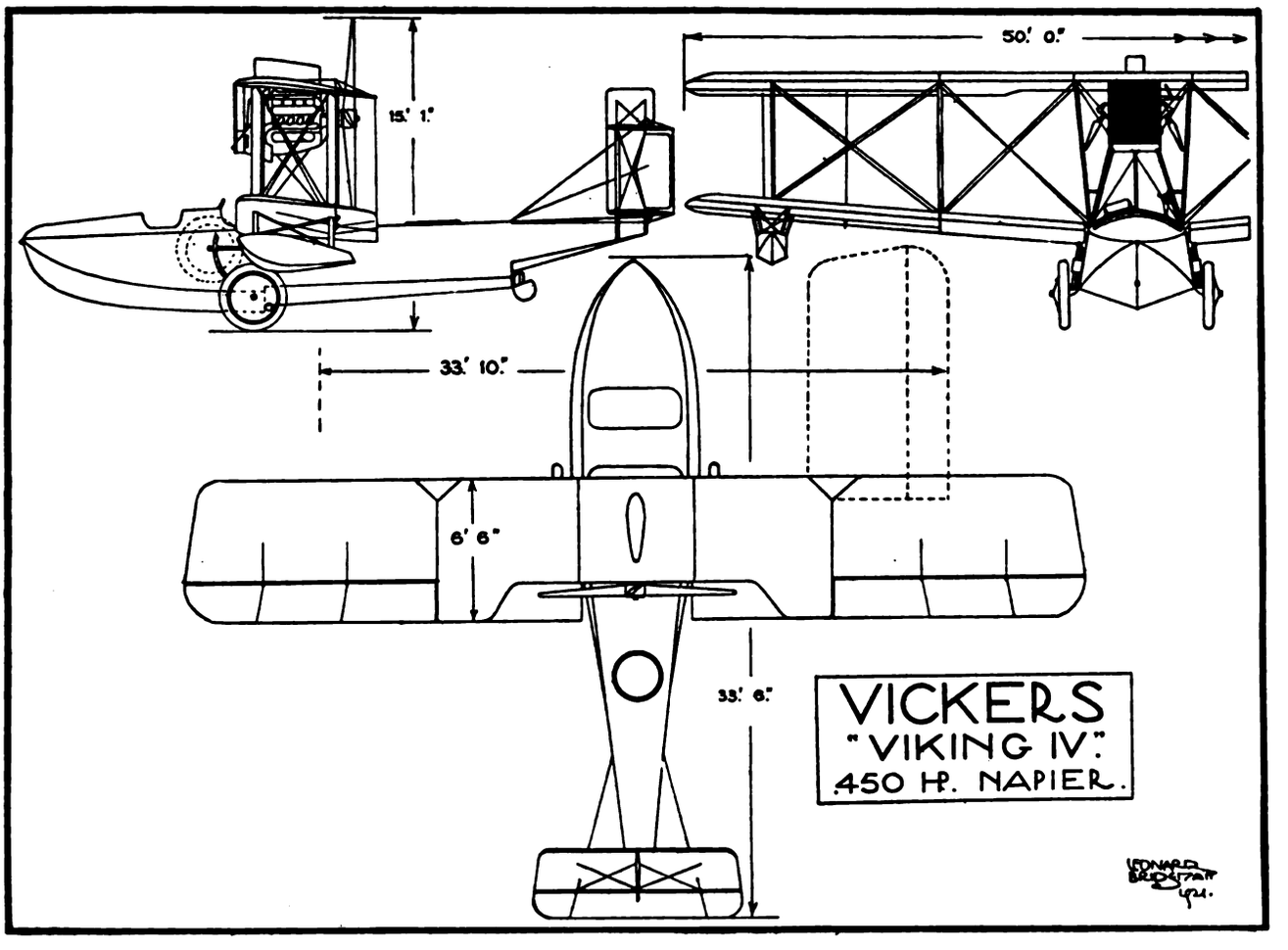
The Vickers firm have continued the work of improving their types of aircraft, and the excellent reputation gained by their various achievements has been still further increased during the past year.

The development of the "Viking" type of amphibian, first described in the last volume, is shown in the following matter, as is their development of the "Vimy" of the commercial type. This latter machine is now to be built in France under licence.

THE VICKERS "VIKINGS."

The first "Viking" (Mark I) was designed at the end of 1918, and had taken the air in February, 1919, and proved that the designer had successfully solved the main problems of producing an aircraft capable of alighting or taking off at will upon either land or water.

"Viking Mark II" was completed at the end of 1919. In all essentials, the lines of the first "Viking" were followed, but an engine of greater power was fitted, the Rolls "Eagle" of 350 h.p. taking the place of the "Falcon" of 250 h.p. The surface was increased, and a number of detailed improvements were made.



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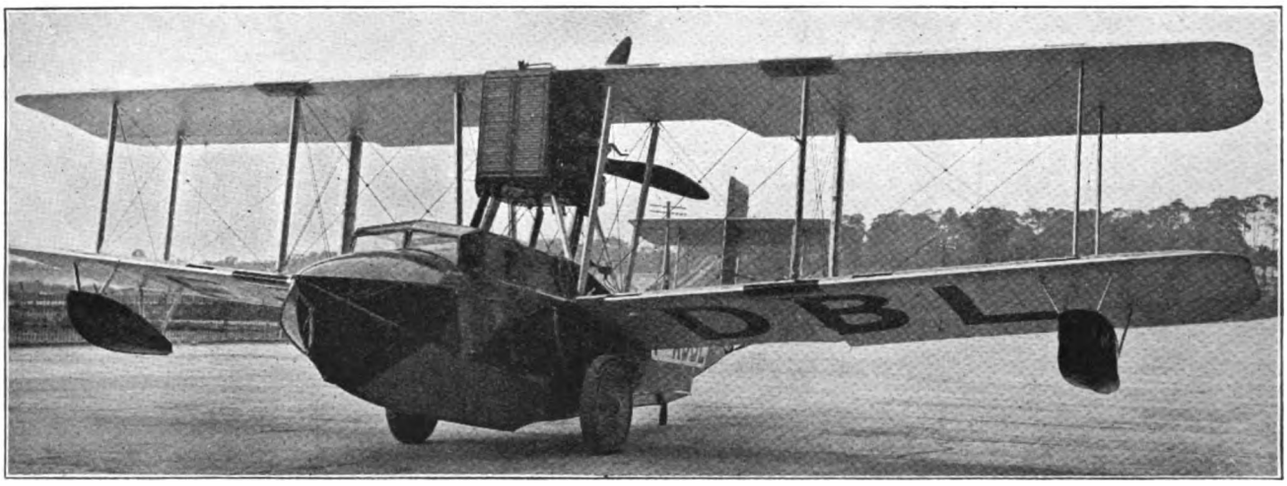
VICKERS—*continued.*



A "Viking" Mark IV (Napier engine) which has been purchased by the French Government.

"Viking Mark III" was produced in 1920, and is well known as the winner of the Air Ministry's competition for commercial amphibians. Here again no drastic alterations in the design were found necessary. A still more powerful engine—the Napier of 450 h.p.—an increased surface, an improved hull, a modification of the fin arrangements, and a decided increase in useful load, and in all-round performance, distinguished the type from its predecessors.

In 1921, Vickers Ltd. produced the Mark IV—still another step along the path indicated by the experience with the first three types.

Specification of the Vickers "Viking Mark IV."

Weights.	
Empty, with water	**3,728 lbs.**
Petrol (80 galls.)	**568 lbs.**
Oil (6 galls.)	**54 lbs.**
Human or commercial load (including pilot)	**1,250 lbs.**
Total	**5,600 lbs.**
General Characteristics.	
Overall length	**33 ft. 6 in.**
Overall height (on wheels)	**15 ft. 1 in.**
Span	**50 ft.**
Span (folded)	**33 ft. 10 in.**
Length (folded)	**35 ft.**
Chord	**6 ft. 6 in.**
Gap (at centre line)	**7 ft. 7 in.**
Incidence of main planes	**6 degs.**
Dihedral, top plane	**0 degs.**
Dihedral of bottom plane	**5 degs.**
Area of main planes	**594 sq. ft.**
Loading per sq. ft. (594)	**9.4 lbs.**
Loading per h.p. (450)	**12.45 lbs.**
Performance (full load)—Napier Engine.	
Full speed (sea level)	**119 m.p.h.**
Time to 6,000 feet	**7.35 mins.**
Full speed at 6,000 feet	**114.5 m.p.h.**
Range at 6,000 feet at full speed	**350 miles.**
Range at 6,000 feet throttled to 90 m.p.h.	**480 miles.**
Absolute ceiling	**18,250 ft.**
Landing speed	**50 m.p.h.**
Performance—Rolls-Royce "Eagle" Engine.	
Full speed (sea level)	**102 m.p.h.**
Time to 6,000 feet	**15.8 mins.**
Full speed at 6,000 feet	**96 m.p.h.**
Range at 6,000 feet at full speed	**380 miles.**
Range at 6,000 feet throttled to 90 m.p.h.	**450 miles.**
Absolute ceiling	**11,000 ft.**
Landing speed	**50 m.p.h.**

THE VICKERS "VULCAN."

This is a single-engined passenger carrier designed for service on the British Air Lines. It is distinguished by the very great depth of its oval section fuselage, which fills the whole wing gap, and by the fact that it has only a single bay of wing bracing on each side.

Owing to the depth of the fuselage, the cabin gives very ample head room for the passengers—a feature somewhat lacking in many machines designed for this purpose.

The machine is shown in scale drawings and photographs attached. It was in regular service on the Instone Air Line during the greater part of 1922. A version of the machine, fitted with the Napier "Lion" engine and of correspondingly increased performance, is now built.

THE VICKERS "VANGUARD."

This is a large twin-engine commercial machine designed to carry 23 passengers and a crew of two. The general outline of the machine is that of the Vickers "Commercial Vimy," described in last year's issue, but on a considerably enlarged scale. A scale drawing reproduced gives the general arrangement and the main dimensions.

A "Viking" Mark IV.

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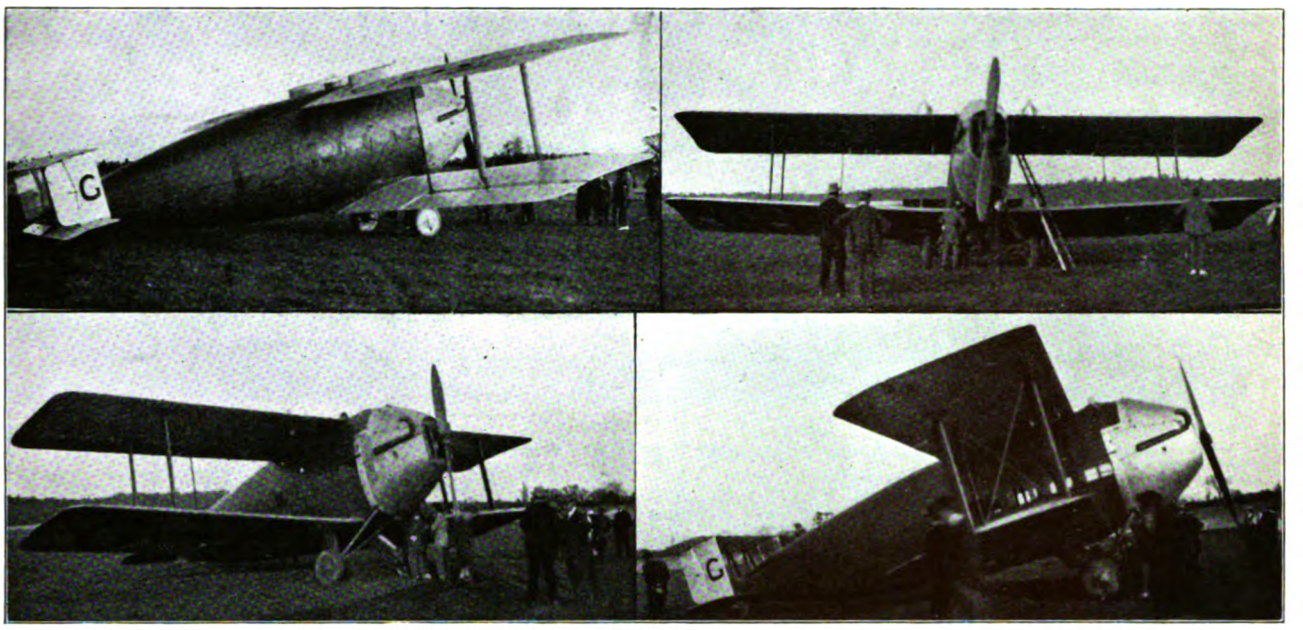
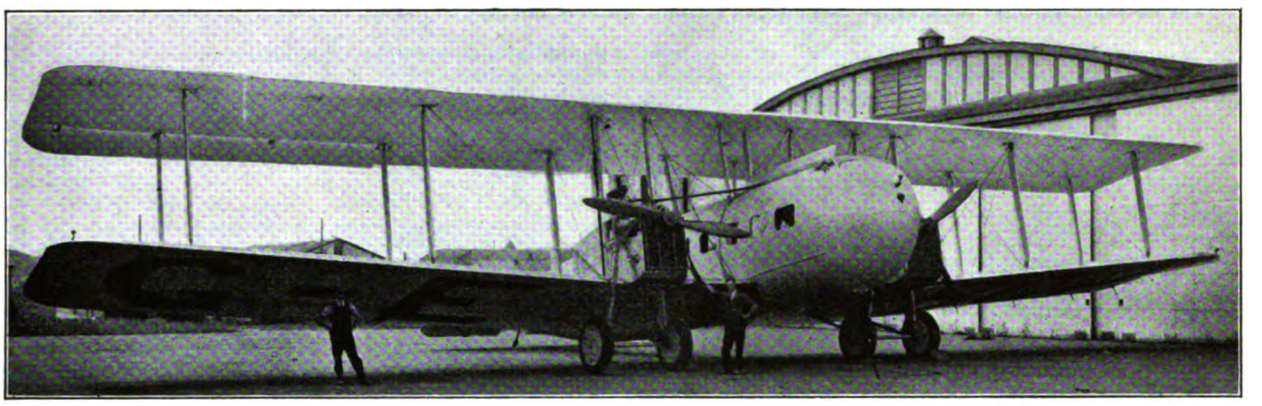
***VICKERS**—continued.*



The Vickers "Vulcan" 8 seater (360 h.p. Rolls-Royce "Eagle.")



The Vickers "Vanguard" Passenger-Carrier (2 Napier engines).

The Vickers "Vulcan" with Napier "Lion" engine.

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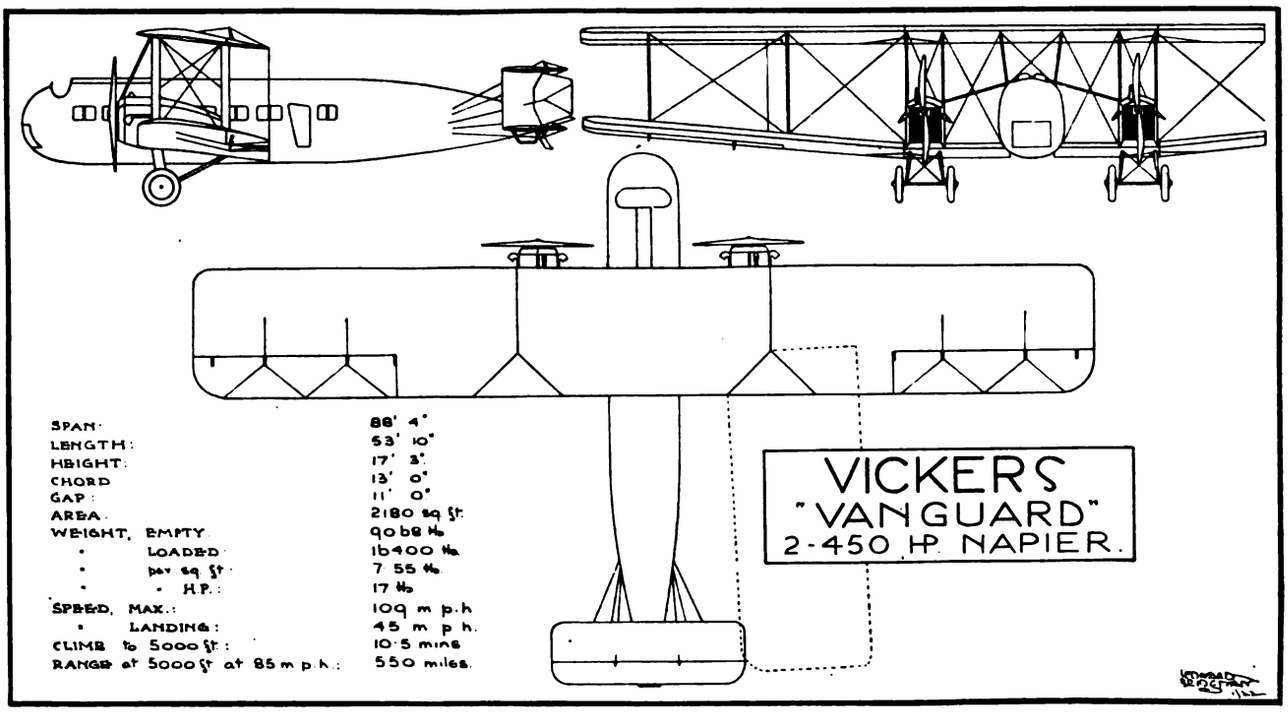
VICKERS—*continued.*

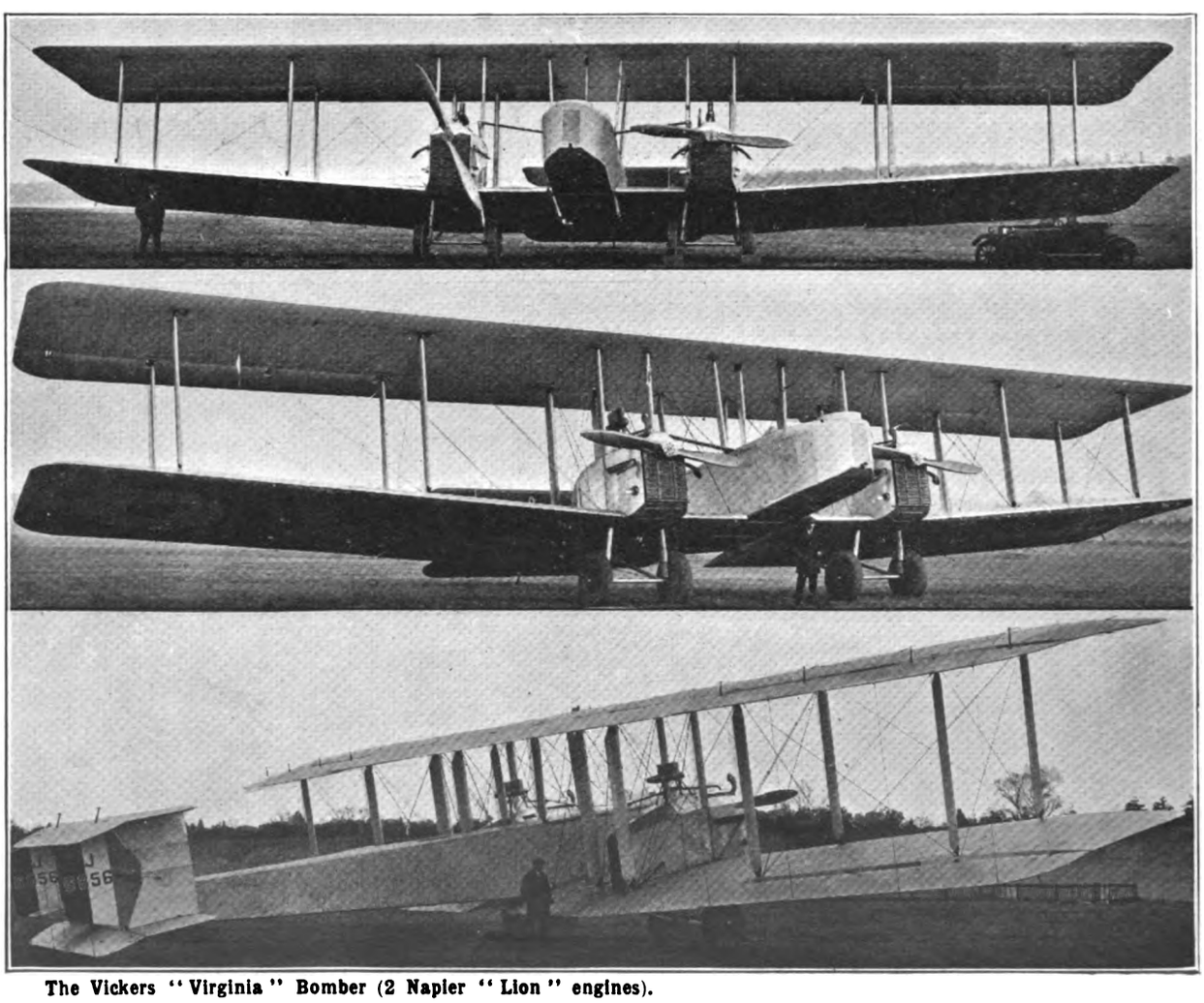

VICKERS
"VANGUARD"
2-450 HP NAPIER.
SPAN: 88' 4"
LENGTH: 53' 10"
HEIGHT: 17' 3"
CHORD 13' 0"
GAP: 11' 0"
AREA: 2180 sq ft
WEIGHT, EMPTY 9068 lbs
" LOADED 16400 lbs
" per sq ft 7·55 lbs
" " H.P.: 17 lbs
SPEED, MAX.: 109 m p.h
" LANDING: 45 m p.h.
CLIMB to 5000 ft: 10·5 mins
RANGE at 5000 ft at 85 m p.h.: 550 miles.

The 25-seater Vickers "Vanguard" Commercial machine which should be useful when air traffic really gets going.

The photograph of the Vickers "Victoria" troop carrier, though it represents a somewhat different machine, is sufficient to give a very clear idea of the general appearance of this type.

THE VICKERS "VICTORIA."

This is another enlarged and modified machine of generally the "Commercial Vimy" type. As it has been constructed to the order of the British Air Ministry, details other than those which can be gathered from the photograph reproduced may not be published. It is, however, a matter of common knowledge that like the "Vanguard" this machine is intended to carry a crew of two and 23 passengers—in the shape of fully equipped infantrymen—and that it is equipped with two Napier "Lion" engines.



The Vickers "Virginia" Bomber (2 Napier "Lion" engines).

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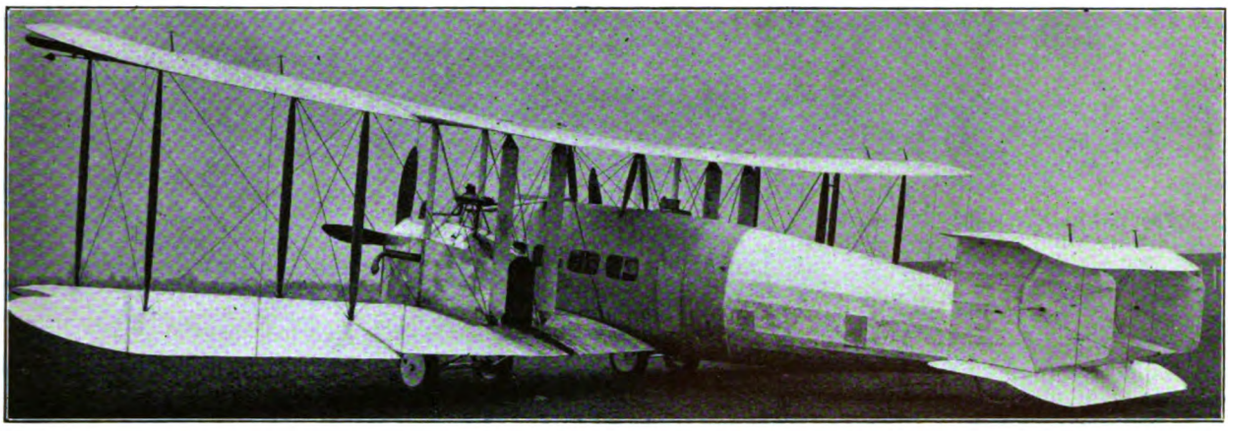
VICKERS—*continued.*



The Vickers "Vernon"—a version of the standard "Vickers" twin engine type equipped as an ambulance.

THE VICKERS "VIRGINIA."

This is another large twin-engined machine—also with Napier "Lion" engines—built for the British Air Ministry. As can be seen in the photograph, this machine follows the design of the original war-time Vimy bomber.

Specification of the Vickers "Virginia."

Purpose	Bombing.
Span	86 ft. 6 in. (26.3 m.).
Chord	13 ft. (3.97 m.).
Length	50 ft. 7 in. (15.4 m.).
Height	16 ft. 11 in. (5.18 m.).
Area of wings	2,166 sq.ft.(203 sq.m.).
Weight empty	9,243 lbs. (4,200 kgs.).
Weight of crew	720 lbs. (327 kgs.).
Weight of fuel and oil	4,070 lbs. (1,850 kgs.).
Weight loaded	2,467 lbs. (1,120 kgs.).
Total weight	1,650 lbs. (7,500 kgs.).
Engines	2 Napier "Lion," 450 h.p. each.
Wing loading	7.6 lbs./sq. ft. (37 kgs./ sq. m.).
Power loading	17 lbs./h.p. (7.7 kgs./ h.p.).
Speed (estimated)	104 m.p.h. (168 km.h.).
Landing speed	46 m.p.h. (74 km.h.).
Climb to 5,000 ft. (1,640m.)	12½ mins.

THE VICKERS "VIXEN."

Vickers produced early in 1923, a two seat fighter fitted with the Napier "Lion" engine, which may not be described. The "Valparaiso," which is mentioned hereafter, is, however, closely similar.

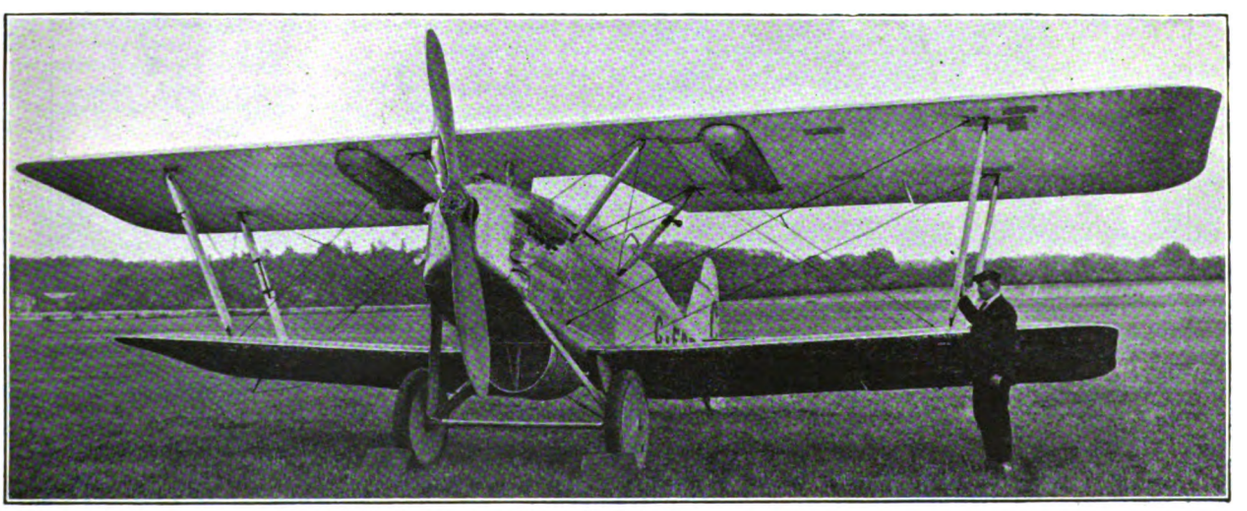
THE VICKERS "VALENTIA."

The Vickers "Valentia" flying-boat, shown in a photograph herewith, is the latest version of the type which was illustrated in the last volume. The machine has been modified in certain important details since the original of the type was produced.

It is now possible to publish a general specification, but no details of equipment, etc., may be made known.

Specification.

Span	112 ft. (34.2 m.).
Length	58 ft. (17.7 m.).
Height	22 ft. (6.72 m.).
Chord	10 ft. 6 in. (3.21 m.).
Wing area	2,025 sq. ft. (188 sq. m.).
Engines	2 Rolls-Royce "Condor," 670 b.h.p. each.
Weight empty	13,600 lbs. (6,200 kgs.).
Weight of fuel	4,338 lbs. (1,939 kgs.).
Weight of crew (5)	900 lbs. (408 kgs.).
Load	2,400 lbs. (1,090 kgs.).
Total weight	21,300 lbs. (9,700 kgs.).
Wing loading	10.5 lbs./sq. ft. (51.5 kgs./ sq. m.).
Power loading	16 lbs./h.p. (7.24 kgs./ h.p.).
Speed	105 m.p.h. (169 km.h.).
Landing speed	53 m.p.h. (86 km.h.).
Climb to 5,000 ft. (1,640 m.)	12 mins.



The Vickers "Vixen" (Napier "Lion" engine).

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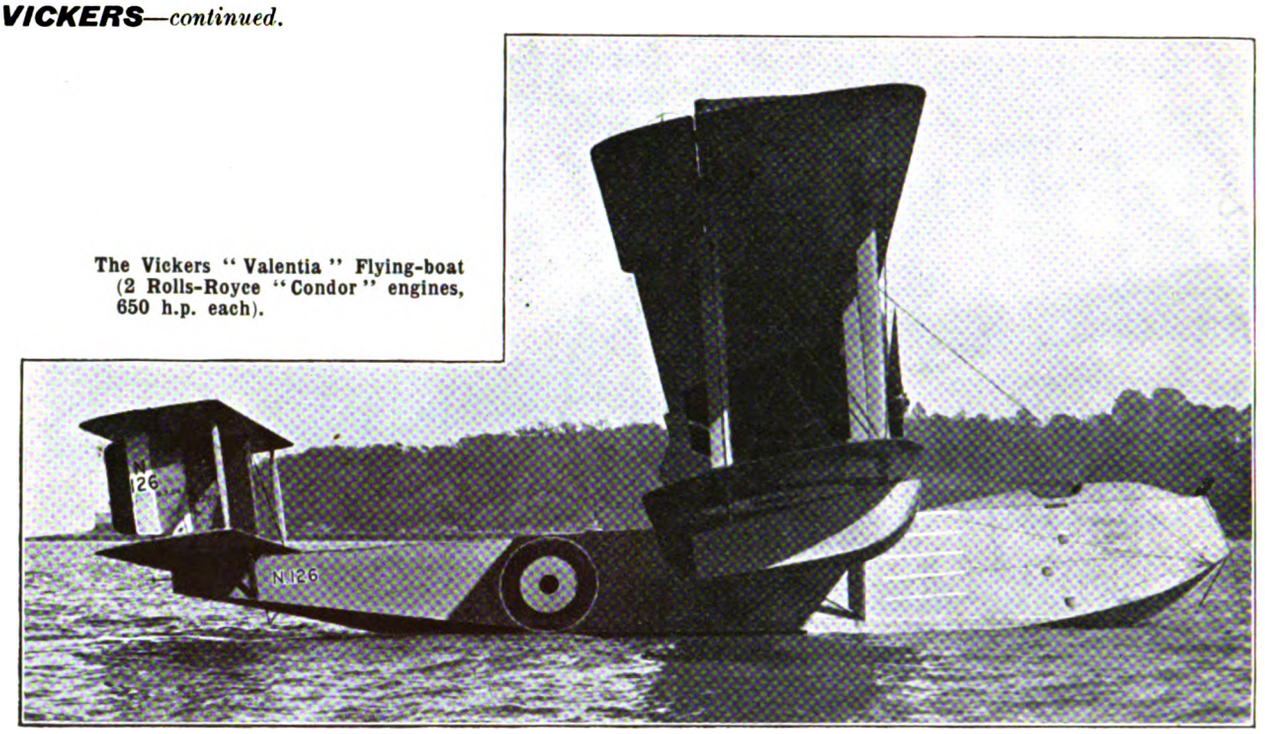
VICKERS—*continued.*



The Vickers "Valentia" Flying-boat (2 Rolls-Royce "Condor" engines, 650 h.p. each).

THE VICKERS "VIGET."

A small biplane fitted with a 750 c.c. "Douglas" motor-cycle engine, which was built for the 1923 Light Aeroplane competitions. The machine is a perfectly normal single-bay tractor biplane of wood and wire construction with folding wings. It proved to fly extremely well, being notable for its manœuvrability

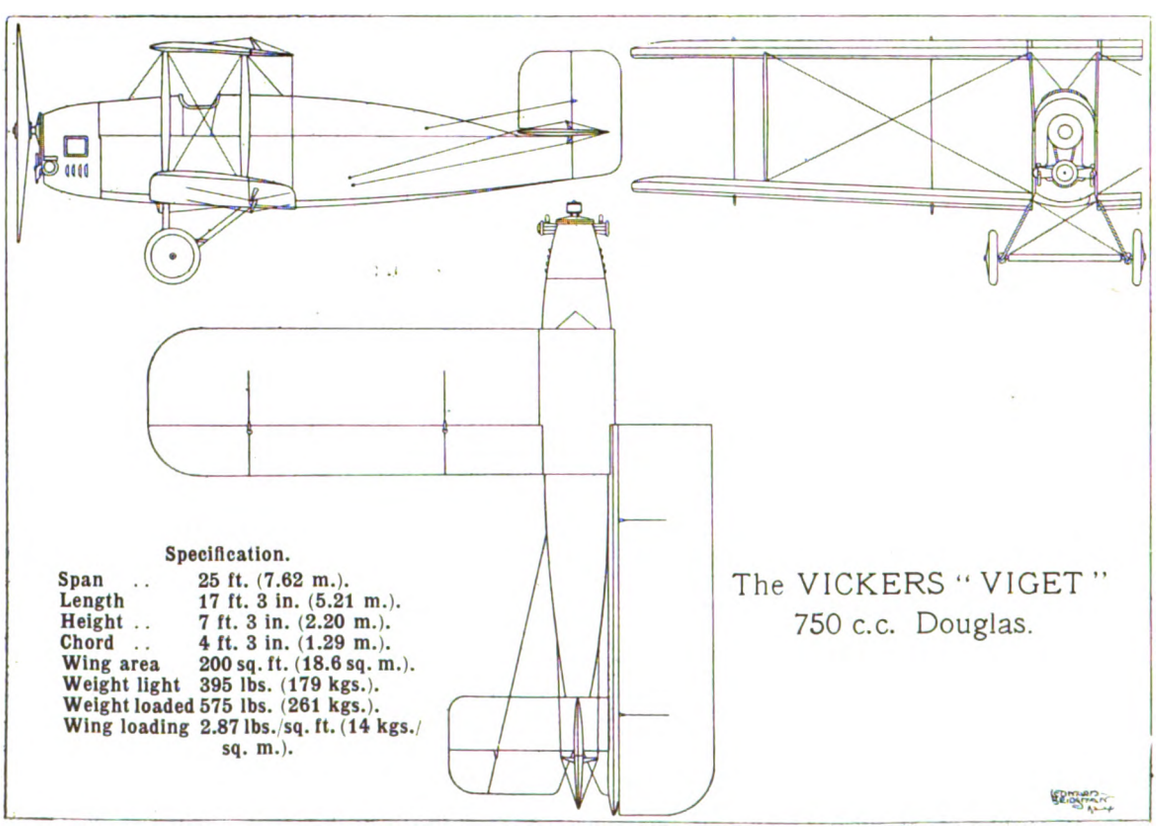
THE VICKERS "VULTURE."

An amphibian flying-boat of modified "Viking" type, designed and built for the attempt to fly round the world by Sq.-Lr. MacLaren. The "Vulture" differs from the previous "Vikings" in that a thicker wing section is used, and thanks to the deeper spars possible, a single bay of bracing on each side is used instead of the two bays of the "Vikings." Both span and chord have been increased—the former by only 3 ft. and the latter by 2 ft. 2 in., this provided a considerably increased wing area.

The hull is similar to that of the "Viking IV," and is covered with Vickers "S.C.T." plywood. The retractable undercarriage follows that of the "Vikings" in principle and general arrangement, but is fitted with an oleo-pneumatic shock-absorber instead of rubber.

The engine—a Napier "Lion" of 450 h.p.—is carried on a steel tube mounting, which is supported entirely independently of the wing structure.

The tail is a biplane, with three fixed fins, which act as inter-tail struts, the central one alone having a rudder attached to it.



Specification.

Span ..	25 ft. (7.62 m.).
Length	17 ft. 3 in. (5.21 m.).
Height ..	7 ft. 3 in. (2.20 m.).
Chord ..	4 ft. 3 in. (1.29 m.).
Wing area	200 sq. ft. (18.6 sq. m.).
Weight light	395 lbs. (179 kgs.).
Weight loaded	575 lbs. (261 kgs.).
Wing loading	2.87 lbs./sq. ft. (14 kgs./sq. m.).

The VICKERS "VIGET"
750 c.c. Douglas.

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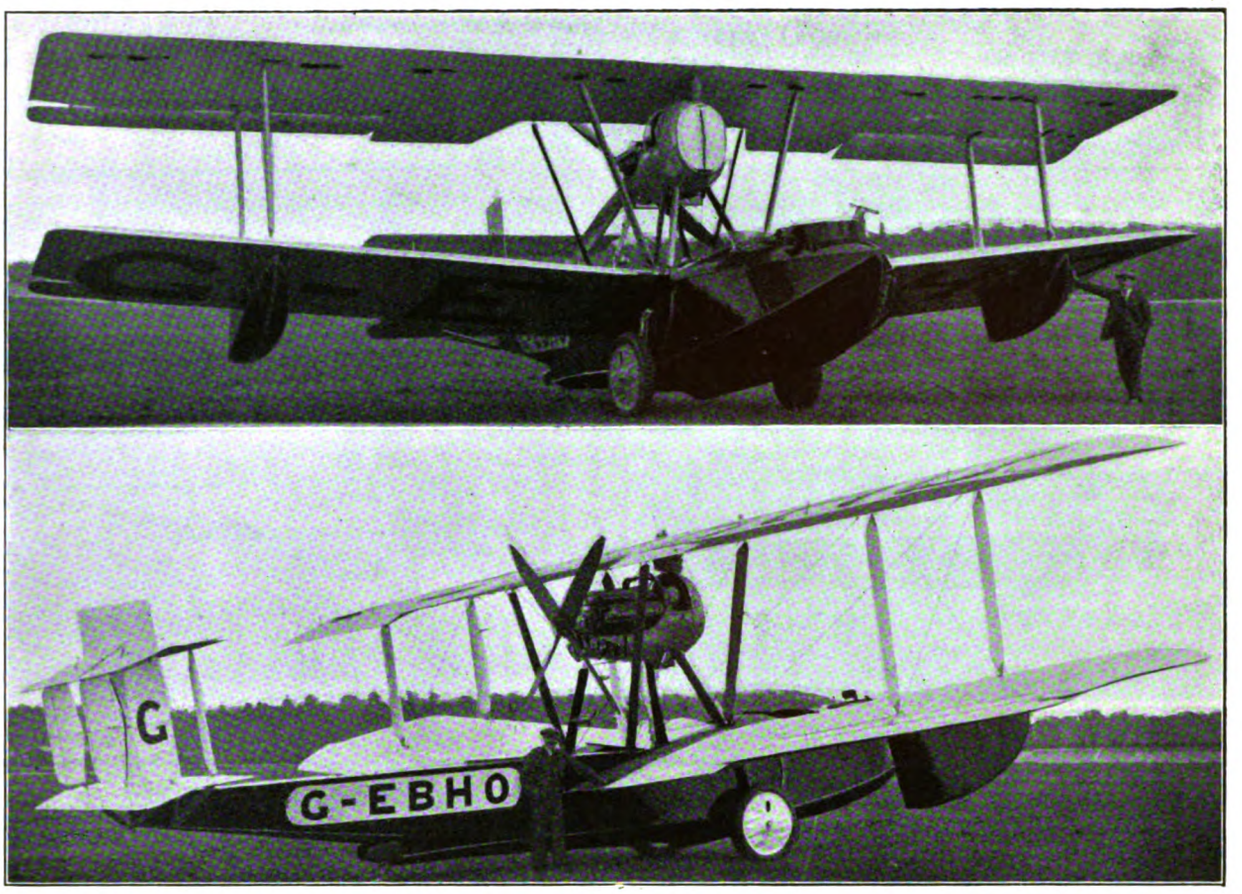
VICKERS—*continued.*



The Vickers "Vulture" (480 h.p. Napier "Lion").

Specification.

Span	**49 ft. (14.95 m.).**
Length	**38 ft. 2 in. (11.94 m.).**
Chord	**9 ft. 3 in. (2.82 m.).**
Wing area	**828 sq. ft. (77 sq. m.).**
Weight loaded	**6,000 lbs. (2,722 kgs.).**
Engine	**Napier "Lion," 450 h.p.**
Wing loading	**7.25 lbs./sq. ft. (35.2 kgs./sq. m.).**
Power loading	**13.3 lbs./h.p. (6.05 kgs./h.p.).**
Speed, sea level	**104 m.p.h. (168 km.h.).**
Landing speed	**46 m.p.h. (74 km.h.).**
Climb to 5,000 ft. (1,525 m.)	**9 mins.**

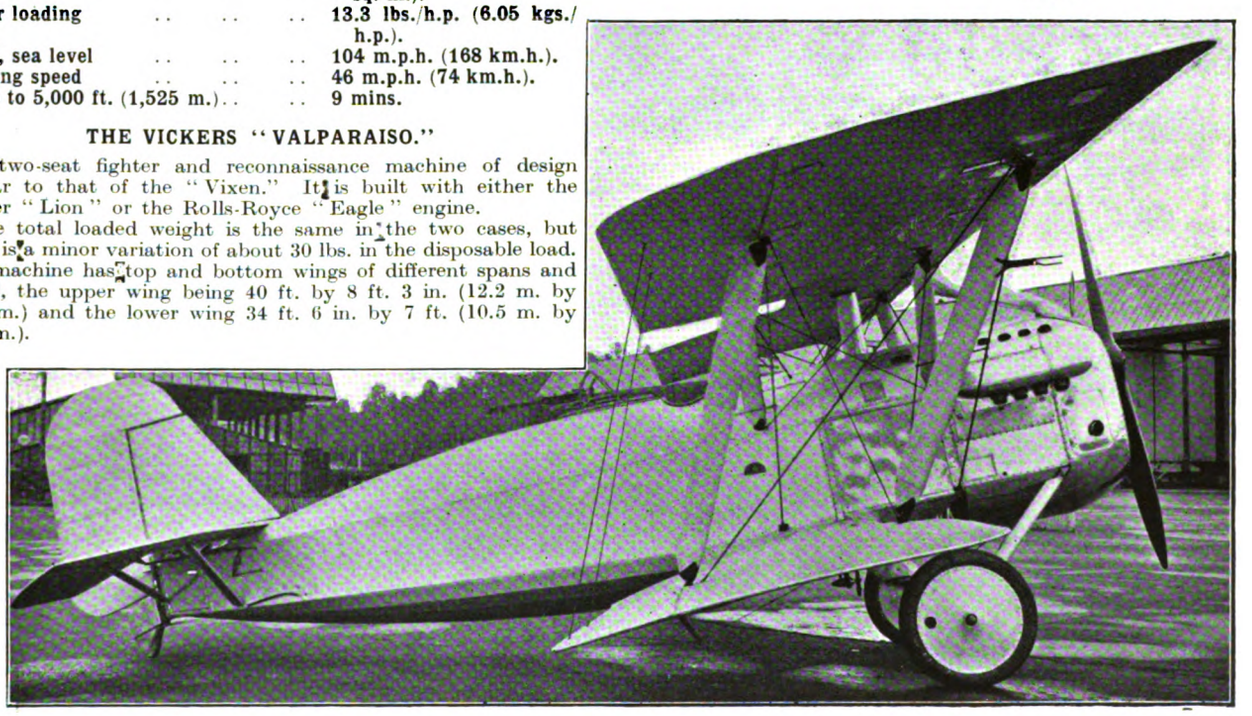
THE VICKERS "VALPARAISO."

A two-seat fighter and reconnaissance machine of design similar to that of the "Vixen." It is built with either the Napier "Lion" or the Rolls-Royce "Eagle" engine.

The total loaded weight is the same in the two cases, but there is a minor variation of about 30 lbs. in the disposable load. The machine has top and bottom wings of different spans and chord, the upper wing being 40 ft. by 8 ft. 3 in. (12.2 m. by 2.57 m.) and the lower wing 34 ft. 6 in. by 7 ft. (10.5 m. by 2.14 m.).

Specification.

Span (top)	**40 ft. (12.2 m.).**
Length	**29 ft. (8.84 m.).**
Height	**11 ft. 8 in. (3.55 m.).**
Wing area	**526 sq. ft. (49 sq. m.).**
Weight empty	**3,128 lbs. (1,422 kgs.).**
Weight loaded	**4,720 lbs. (2,145 kgs.).**
Engine	**Napier "Lion" (486 b.h.p.).**



The Vickers "Valparaiso" (Napier "Lion" engine).

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VICKERS—*continued.*

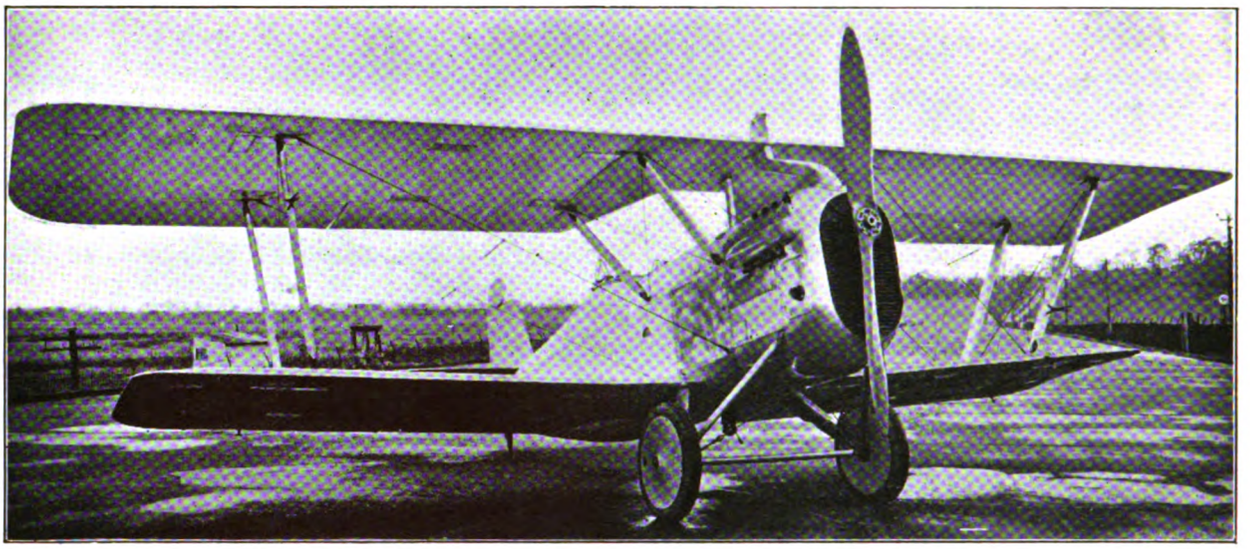
Wing loading	**9 lbs./sq. ft. (44 kgs./sq. m.).**
Power loading	**9.7 lbs./h.p. (4.4 kgs./h.p.)**
Speed at 10,000 ft. (3,050 m.)	**140 m.p.h. (226 km.h.).**
Climb to 10,000 ft. (3,050 m.)	**10.2 mins.**
Duration at 10,000 ft. (3,050 m.)	**110 m.p.h. (177 km.h.), 5 hrs.**

Performance with Rolls-Royce "Eagle IX."

Speed at 10,000 ft. (3,050 m.)	**121 m.p.h. (195 km.h.).**
Climb to 10,000 ft. (3,050 m.)	**16 mins.**

THE VICKERS "VENTURE."

Another modified "Vixen" now being built for the Air Ministry, and not therefore to be described.



The Vickers "Valparaiso."

THE WESTLAND AIRCRAFT WORKS,

Yeovil, Somerset.

Branch of famous engineering firm of Petters, Ltd.

Under the management of Mr. R. A. Bruce, M.I.M.E., A.M.I.C.E., M.Sc., formerly of British and Colonial Aeroplane Co., Ltd., and previously connected with the Brennan Torpedo and Brennan Gyroscopic Monorail.

During the period of hostilities the firm built numerous machines to the specifications of the Air Department, Admiralty, and in addition produced to their own designs a number of highly successful machines which were described in the 1919 edition of "All the Worlds Aircraft."

The directorate, having firm faith in the future of aviation, determined to maintain their connection with the Aircraft Industry through the lean times which have inevitably followed the War, and have shown their ability to produce peace-time aircraft of the very highest class.

THE WESTLAND SIX-SEATER.

This machine was built for the 1920 Air Ministry Competition for Commercial Machines, and won the first prize in the small class.

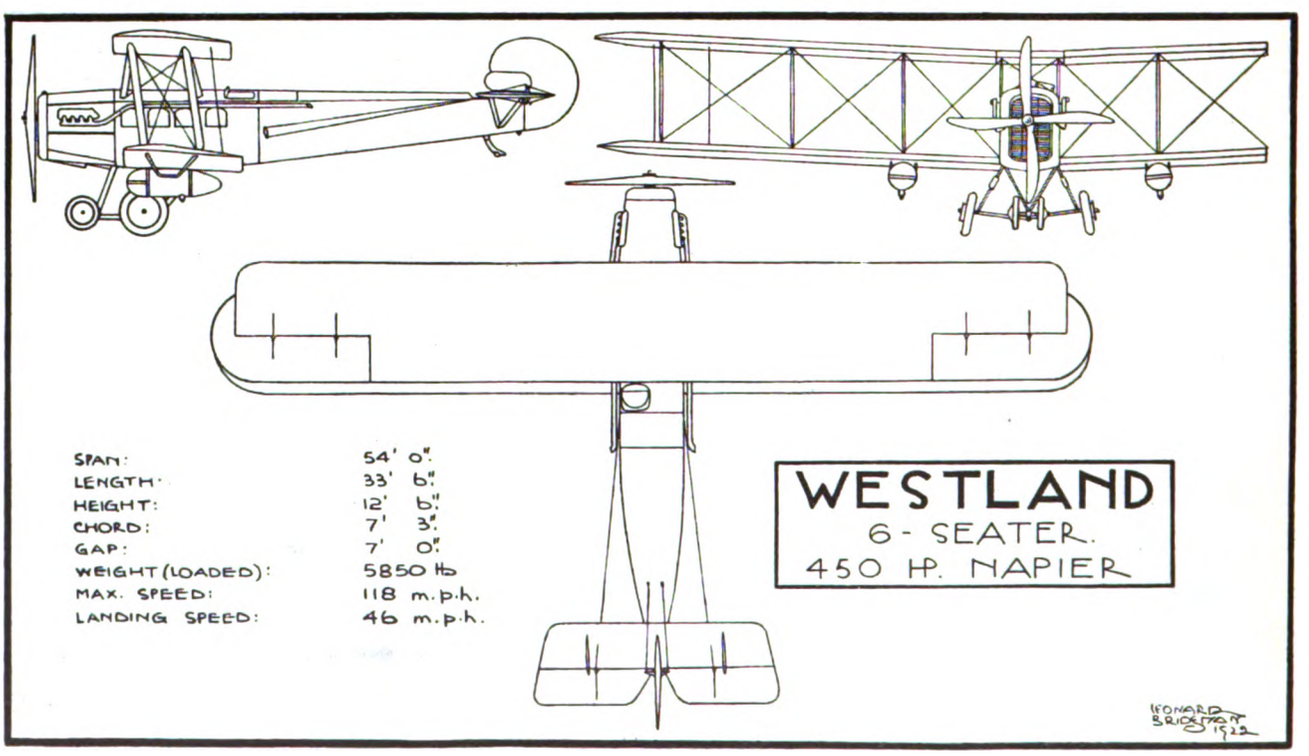
It is a modification of the smaller "Limousine" described in the previous issues, fitted with a larger engine and capable of carrying a considerably increased load.

The general arrangement is precisely similar to the smaller type, the passengers being seated within a cabin, which also contains the pilot's cockpit.

Special precautions are taken to guard against fire risks, and for this purpose the petrol tanks are carried on the lower wings.

Another notable change is the fitting of an undercarriage with forward "trip" wheels.

The main dimensions are given on the drawing attached.



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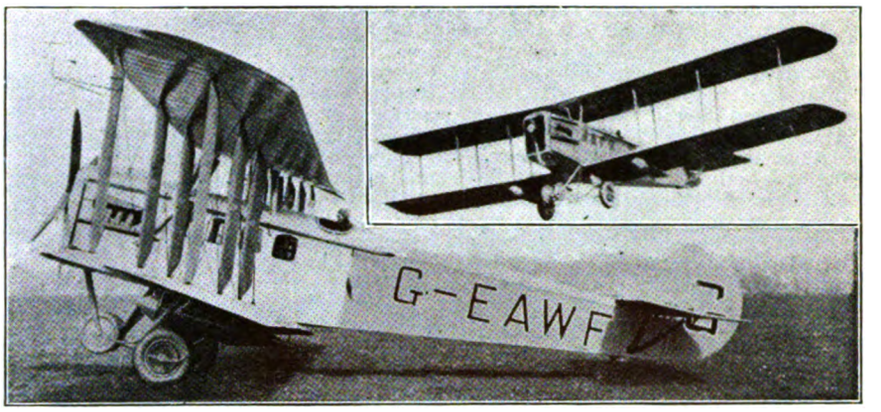
WESTLAND—*continued.*



A Westland Commercial Machine which has been used by the Air Ministry for night flying experiments.

A LATER WESTLAND PASSENGER CARRIER.

The machine is a modification of the six-seater Westland which did so well in the Air Ministry Competition for Commercial Aircraft in 1920.

The cabin is fitted as before for five passengers; the engine remains a Napier "Lion." The airworthiness certificate load is 150 lbs. greater than that of the first machine of the type, the total permissible weight now being 6,000 lbs., which corresponds to 1,200 lbs. of disposable load.

Petrol tanks, which are as before entirely without the fuselage, the two main slung under the lower wing and the gravity-tank in the centre section, have a capacity of 99 gallons, giving the machine fuel for 5½ hours' flight at cruising speed.

THE WESTLAND "WALRUS."

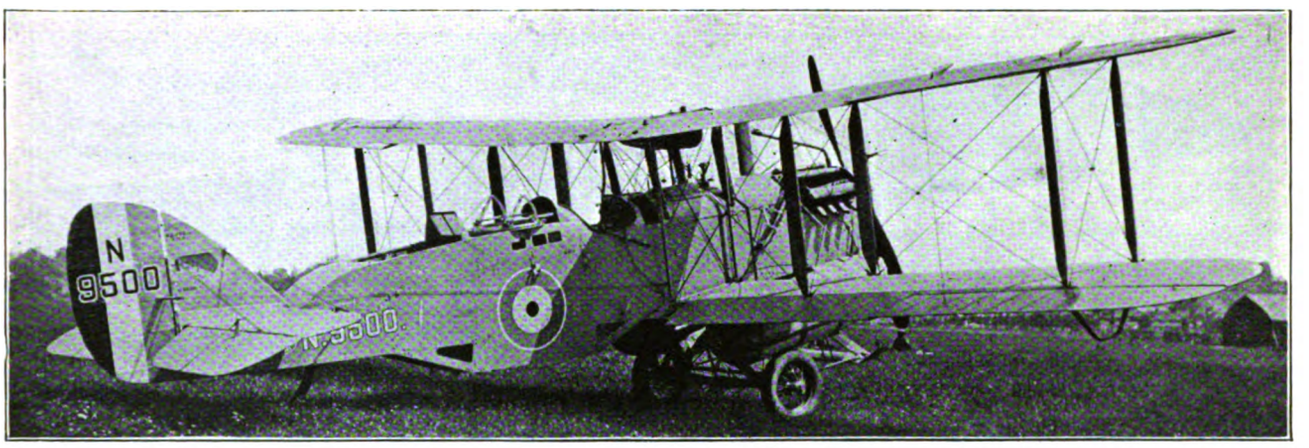
The machine known as the "Walrus" is the result of an Air Ministry attempt to modify a DeH.9a for fleet spotting purposes. The requirements of the Navy called for the carriage of a pilot, a wireless operator, a gunner and an observer. The latter had to have a clear view downwards, and therefore was fitted into a projection in the belly of the fuselage. The machine had, in addition, to carry gear of all kinds, including emergency flotation gear, deck landing gear, and a high performance was called for.

The Westland Company have succeeded in producing the "Walrus," shown in the photographs. As can be seen, it is not beautiful, and one gathers that it is not pleasant to handle.

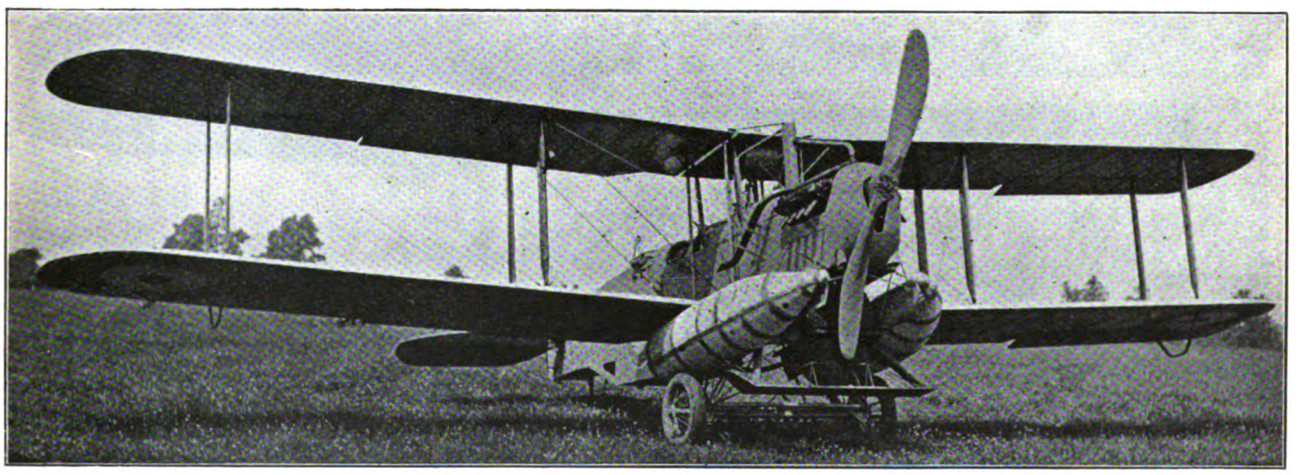
The machine is fitted with a 450 h.p. Napier engine.

EXPERIMENTAL DEVELOPMENTS.

The firm has for a long time been engaged on the development of a very unusual form of monoplane of all-metal construction, concerning which extreme secrecy is maintained.



Three-quarter rear view of the Westland "Walrus" (Napier engine) showing the observer's quarters under the fuselage.



Three-quarter front view of the Westland "Walrus" showing the flotation bags inflated and the leading hydro-vane.

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THE AIRCRAFT DISPOSAL COMPANY LTD.

Office Address : Regent House, Kingsway, London, W.C.2.
Works and Aerodrome : Waddon, near Croydon, Surrey.

The Aircraft Disposal Company, Ltd., was formed in 1919, and under an agreement with the British Government took over from the Government the whole of the surplus aircraft, aero-engines and aircraft accessories in the possession of the Royal Air Force.

Since their formation, the Company has done a very large business both in Britain and abroad in supplying customers of all kinds with aircraft and aircraft material. Of the stocks taken over, a very large volume consisted of obsolete aircraft and equipment, useless for any aeronautical purpose, and a very big proportion of such material has been disposed of at very low prices, either for purposes other than aeronautical or admittedly as scrap.

But in addition to this type of material there still remains a large stock of serviceable aircraft, engines, and accessories of types still in use in the British service. The Aircraft Disposal Company, from this stock, has supplied many hundreds of machines, both to private concerns and to foreign Governments in all parts of the world.

At their works at Waddon they maintain a large and competent staff. Further, they undertake modification of standard machines to meet the requirements of users and maintain an adequate designing staff for that purpose. They do not manufacture aeroplanes, and for this reason they have not been included in the foregoing pages which relate to British aeroplane manufacturers as such.

In no case do they deliver machines except after thorough overhaul, re-conditioning and test.

No guide to the present state of the British Aircraft Industry would be complete without a reference to this firm, and therefore this note, together with the following illustrations and specifications of machines which they have available for prompt delivery is given here.

The Aircraft Disposal Company have recently acquired the name, goodwill and manufacturing rights of Martinsyde, Ltd., and, it is understood, propose to engage actively in manufacturing in the future.

The Martinsyde F.4.

Specification.

Overall Sizes.—Length : (7.77 m.) 25 ft. 6 in. Height : (3.15 m.) 10 ft. 4 in. Span : (9.98 m.) 32 ft. 9 in.

Tankage.—Petrol : (164 l.) 36 galls. Oil : (18 l.) 4 galls.

Weight.—Gross : (1,038 kgs.) 2,289 lbs. Empty : (776 kgs.) 1,710 lbs.

Performance.—Speed at (3,050 m.) 10,000 feet : (229.5 k.p.h.) 142.5 m.p.h. Speed at (4,572 m.) 15,000 feet : (219.5 k.p.h.) 136.5 m.p.h.

Landing speed : (72.5 k.p.h.) 45 m.p.h.

Climb to (1,981 m.) 6,500 feet : 4 mins. Climb to (3,050 m.) 10,000 feet : 6.7 mins. Climb to (4,572 m.) 15,000 feet : 11.8 mins. Climb to (6,096 m.) 20,000 feet : 19.3 mins.

Ceiling : (7,620 m.) 25,000 feet.

The Avro 504K (110 h.p. Le Rhône).

Specification.

Overall Sizes.—Length : (8.97 m.) 29 ft. 5 in. Height : (3.17 m.) 10 ft. 5 in. Span : (10.97 m.) 36 ft.

Tankage.—Petrol : (116 l.) 25.5 galls. Oil : (27 l.) 6 galls.

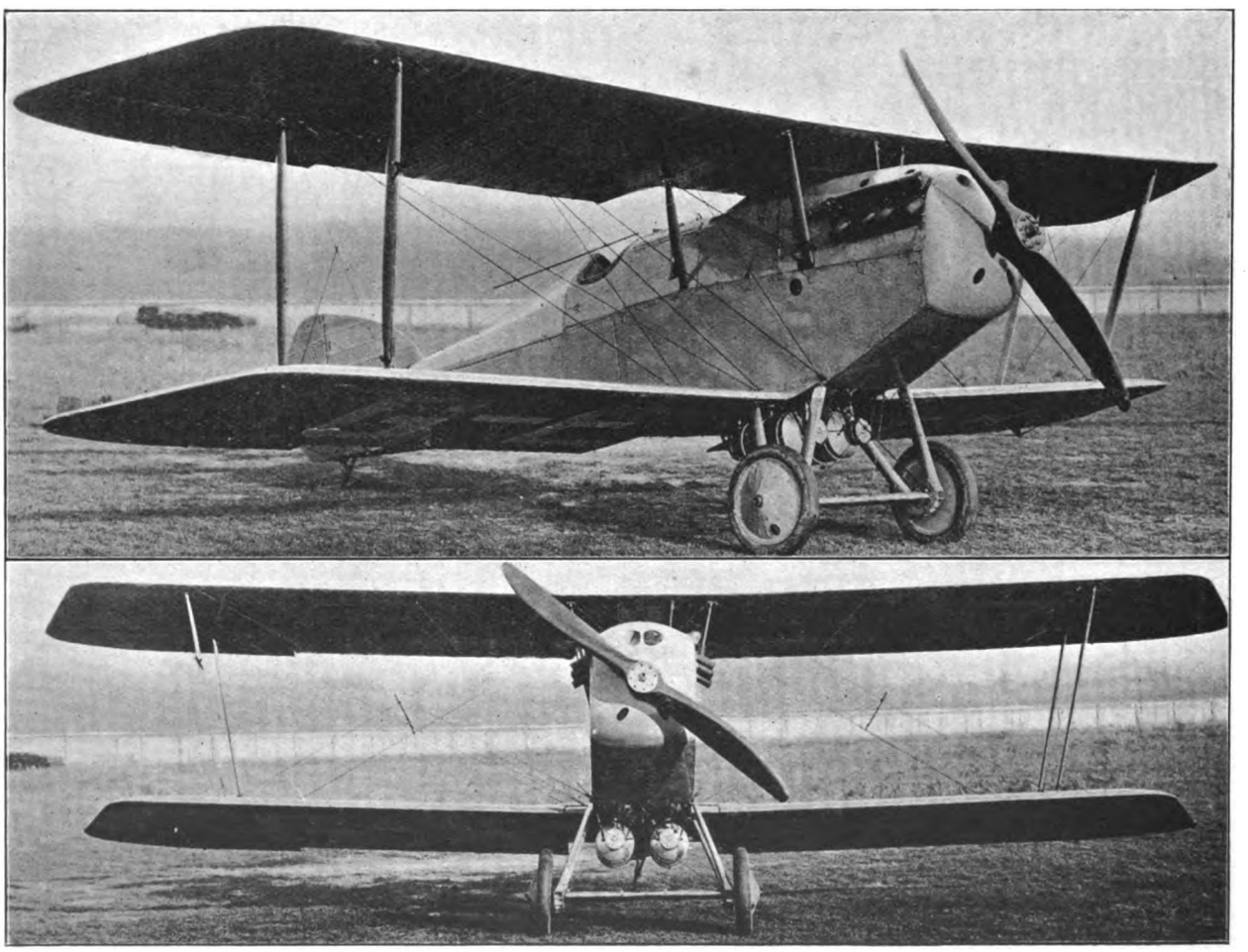
Weight.—Gross : (993 kgs.) 2,189 lbs. Empty : (558 kgs.) 1,231 lbs.

Performance.—Speed at (1,524 m.) 5,000 feet : 85 m.p.h. Speed at (3,050 m.) 10,000 feet : 79 m.p.h.

Landing speed : (64 k.p.h.) 40 m.p.h.

Climb to (1,524 m.) 5,000 feet : 7 mins. Climb to (3,050 m.) 10,000 feet : 16 mins.

Ceiling : (4,115 m.) 13,500 feet.



An A.D.C Martinsyde F.4 (300 H.P. Hispano-Suiza) fitted with Lamblin radiators. This increases the speed by some 10 m.p.h.

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A.D.C.—*continued.*

The A.D.C. De H.9A (360 h.p. Rolls-Royce "Eagle") with Lamblin radiators.

The DeH.9 Bomber (Siddeley "Puma" 230 h.p.).

Specification.

Overall Sizes.—Length : (9.39 m.) 30 ft. 10 in. Height : (3.4 m.) 11 ft. 2 in. Span : (12.9 m.) 42 ft. 4 in.

Tankage.—Petrol : (318 l.) 70 galls. Oil : (27 l.) 6 galls.

Weight.—Gross : (1,508 kgs.) 3,325 lbs. Empty : (1,012 kgs.) 2,230 lbs.

Performance.—Speed at (1,981 m.) 6,500 feet : (178 k.p.h.) 110.5 m.p.h. Speed at (3,050 m.) 10,000 feet : (176 k.p.h.) 109.5 m.p.h. Speed at (4,572 m.) 15,000 feet : (165 k.p.h.) 102.5 m.p.h.
Landing speed : (92 k.p.h.) 57 m.p.h.
Climb to (1,981 m.) 6,500 feet : 12 mins. Climb to (3,050 m.) 10,000 feet : 20 mins. Climb to (4,572 m.) 15,000 feet : 42 mins.
Ceiling : (4,724 m.) 15,500 feet.

The DeH.9A (360 h.p. Rolls-Royce).

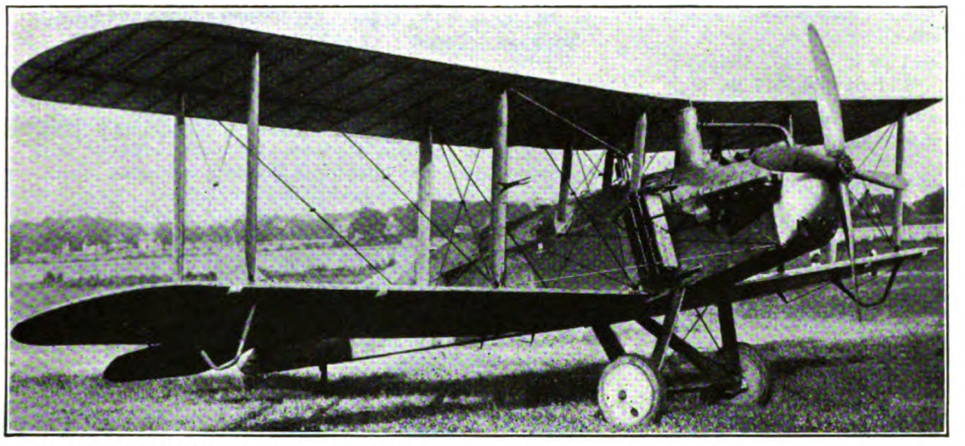
Specification.

Overall Sizes.—Length : (9.22 m.) 30 ft. 3 in. Height : (3.45 m.) 11 ft. 4 in. Span : (14.01 m.) 45 ft. 11 in.

Tankage.—Petrol : (486 l.) 107 galls. Oil : (77 l.) 17 galls.

Weight.—Gross : (1,914 kgs.) 4,220 lbs. Empty : (1,256 kgs.) 2,770 lbs.

Performance.—Speed at (3,050 m.) 10,000 feet : (193 k.p.h.) 120 m.p.h. Speed at (4,572 m.) 15,000 feet : (183.5 k.p.h.) 114 m.p.h.
Landing speed : (95 k.p.h.) 59 m.p.h.
Climb to (1,981 m.) 6,500 feet : 6.8 mins. Climb to (3,050 m.) 10,000 feet : 11.8 mins. Climb to (4,572 m.) 15,000 feet : 22.8 mins.
Ceiling : (5,791 m.) 19,000 feet.



An A.D.C. D.H.9A Single-seater with Napier engine, entered in various races during 1923.

The DeH.9A (450 h.p. Napier).

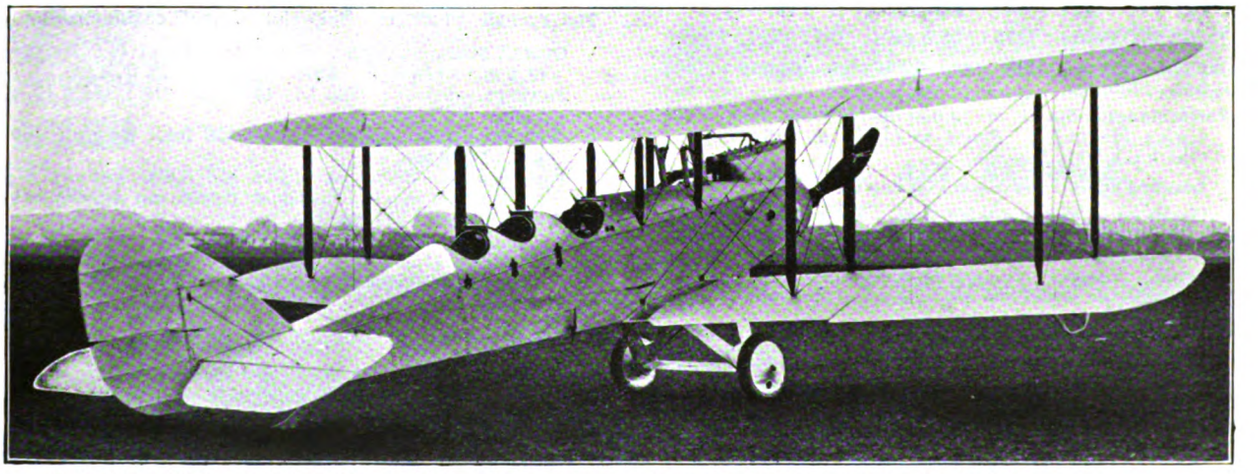
Specification.

Overall Sizes.—Length : (9.22 m.) 30 ft. 3 in. Height : (3.45 m.) 11 ft. 4 in. Span : (14.01 m.) 45 ft. 11 in.

Tankage.—Petrol : (486 l.) 107 galls. Oil : (77 l.) 17 galls.

Weight.—Gross : (2,113 kgs.) 4,660 lbs. Empty : 2,557 lbs.

Performance.—Speed at (3,050 m.) 10,000 feet : (216.4 k.p.h.) 134.5 m.p.h. Speed at (4,572 m.) 15,000 feet : (202 k.p.h.) 125.5 m.p.h.
Climb to (3,050 m.) 10,000 feet : 10.5 mins.
Ceiling : (6,462 m.) 21,300 feet.



A DeH.9 (240 h.p. Siddeley "Puma,") modified as a general purpose three-seater by the A.D.C.

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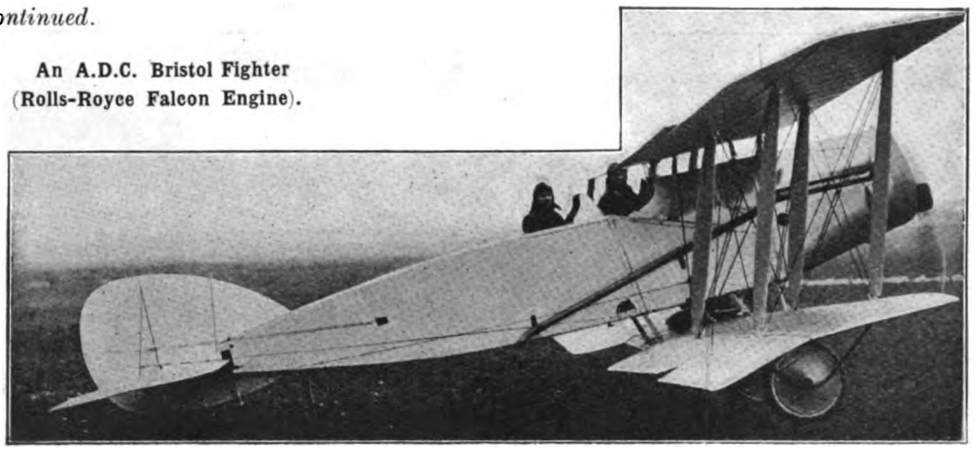
A.D.C.—*continued.*

An A.D.C. Bristol Fighter
(Rolls-Royce Falcon Engine).



The Bristol Fighter (300 h.p. Hispano).

Specification.

Overall Sizes.—Length : (7.85 m.) 25 ft. 9 in. Height : (3.07 m.) 10 ft. 1 in. Span : (11.97 m.) 39 ft. 3 in.

Tankage.—Petrol : (173 l.) 38 galls. Oil : (14 l.) 3 galls.

Weight.—Gross : (1,261 kgs.) 2,779 lbs. Empty : (877 kgs.) 1,934 lbs.

Performance.—Speed at (1,981 m.) 6,500 feet : (191.5 k.p.h.) 119 m.p.h. Speed at (3,050 m.) 10,000 feet : (182 k.p.h.) 113 m.p.h.

Landing speed : (77 k.p.h.) 48 m.p.h.

Climb to (1,524 m.) 5,000 feet : 6.5 mins. Climb to (1,981 m.) 6,500 feet : 11.25 mins. Climb to (3,050 m.) 10,000 feet : 21.3 mins.

Ceiling : (6,096 m.) 20,000 ft.

The S.E.5A.

Specification.

Overall Sizes.—Length : (6.38 m.) 20 ft. 11 in. Height : (2.89 m.) 9 ft. 6 in. Span : (8.11 m.) 26 ft. 7 in.

Tankage.—Petrol : 35 galls. Oil : 3.5 galls.

Weight.—Gross : (886 kgs.) 1,953 lbs. Empty : (635 kgs.) 1,400 lbs.

Performance.—Speed at (3,050 m.) 10,000 feet : (201 k.p.h.) 125 m.p.h. Speed at (4,572 m.) 15,000 feet : (195 k.p.h.) 121 m.p.h.

Landing speed : (88.5 k.p.h.) 55 m.p.h.

Climb to (1,981 m.) 6,500 feet : 6 mins. Climb to (3,050 m.) 10,000 feet : 10.3 mins. Climb to (4,572 m.) 15,000 feet : 18.8 mins.

Ceiling : (6,705 m.) 22,000 feet.

The Sopwith Snipe (B.R.II).

Specification.

Overall Sizes.—Length : (5.79 m.) 19 ft. Height : (2.89 m.) 9 ft. 6 in. Span : (9.48 m.) 31 ft. 1 in.

Tankage.—Petrol : (175 l.) 38.5 galls. Oil : (32 l.) 7 galls.

Weight.—Gross : (885 kgs.) 1,950 lbs. Empty : (562 kgs.) 1240 lbs.

Performance.—Speed at (3,050 m.) 10,000 feet : 190 k.p.h.) 118 m.p.h. Speed at (4,572 m.) 15,000 feet : (181 k.p.h.) 112.5 m.p.h.

Landing speed : (88 k.p.h.) 55 m.p h.

Climb to (1,981 m.) 6,500 feet : 4.9 mins. Climb to (3,050 m.) 10,000 feet : 8.8 mins. Climb to (4,572 m.) 15,000 feet : 17.8 mins.

Ceiling : (5,943 m.) 19,500 feet.

The DeH.9c Commercial Four-seater.

Specification.

Overall Sizes.—Length : (9.39 m.) 30 ft. 10 in. Height : (3.4 m.) 11 ft. 2 in. Span : (12.9 m.) 42 ft. 4 in.

Tankage.—Petrol : (318 l.) 70 galls. Oil : (27 l.) 6 galls.

Weight.—Gross : (1,508 kgs.) 3,325 lbs. Empty : (1,012 kgs.) 2,230 lbs.

Performance.—Speed at (1,981 m.) 6,500 feet : (178 k.p.h) 110.5 m.p.h. Speed at (3,050 m.) 10,000 feet : (176 k.p.h.) 109.5 m.p.h. Speed at (4,572 m.) 15,000 feet : (165 k.p.h.) 102.5 m.p.h.

Landing speed : (92 k.p.h.) 57 m.p.h.

Climb to (1,981 m.) 6,500 feet : 10.3 mins. Climb to (3,050 m.) 10,000 feet : 18.8 mins. Climb to (4,572 m.) 15,000 feet : 42 mins.

Ceiling : (4,724 m.) 15,500 feet.

The F3 flying-boat (2—360 h.p. Rolls-Royce).

Overall Sizes.—Length : (14.94 m.) 49 ft. Height : (5.69 m.) 18 ft. 8 in. Span : (31.09 m.) 102 ft.

Tankage.—Petrol : (1,182 l.) 260 galls. Oil : (68 l.) 15 galls.

Weight.—Gross : (5,395 kgs.) 11,900 lbs. Empty : (3,468 kgs.) 7,650 lbs.

Performance.—Speed at (1,524 m.) 5,000 feet : (128.75 k.p.h.) 80 m.p.h.

Landing speed : (101 k.p.h.) 63 m.p.h.

Climb to (1,981 m.) 6,500 feet : 27 mins.

The N.T.2B flying boat.

Overall Sizes.—Length : (8.33 m.) 27 ft. 4 in. Height : (3.25 m.) 10 ft. 8 in. Span : (14.73 m.) 48 ft. 4 in.

Tankage.—Petrol : (273 l.) 60 galls. Oil : (36 l.) 8 galls.

Weight.—Gross : (1,322 kgs.) 2,910 lbs. Empty : (930 kgs.) 2,050 lbs.

Performance.—Speed at (1,524 m.) 5,000 feet : (137 k.p.h.) 85 m.p.h.

Landing speed : (80 k.p.h.) 50 m.p.h.

Climb to (1,524 m.) 5,000 feet : 10 mins.

Ceiling (4,267 m.) 14,000 feet.

The Parnall "Panther" Ship-plane (B.R.II engine, 230 h.p.)

Overall Sizes.—Length : (7.6 m.) 24 ft. 11 in. Height : (3.2 m.) 10 ft. 6 in. Span : (8.99 m.) 29 ft. 6 in.

Tankage.—Petrol : (223 l.) 49 galls. Oil : (45.5 l.) 10 galls.

Weight.—Gross : (1,091 kgs.) 2,406 lbs. Empty : (602 kgs.) 1,328 lbs.

Performance.—Speed at (1,524 m.) 5,000 feet : (186.5 k.p.h.) 116 m.p.h. Speed at (3,050 m.) 10,000 feet : (178.5 k.p.h.) 111 m.p.h.

Landing speed : (64.5 k.p.h.) 40 m.p.h.

Climb to (1,524 m.) 5,000 feet : 5 mins. Climb to (1,981 m.) 6,500 feet : 12.5 mins.

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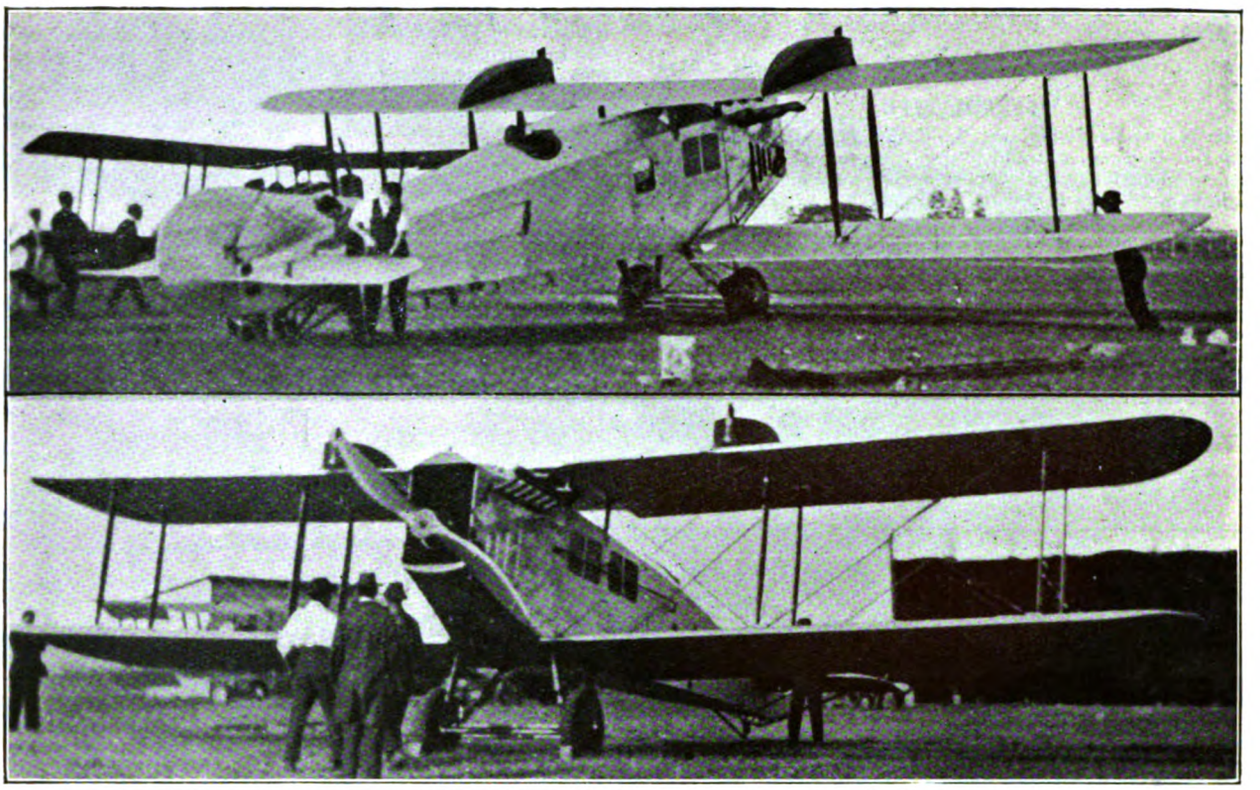
BRITISH DOMINIONS.

AUSTRALIA.



The Australian Aircraft and Engineering Company's Five-seater Commercial Machine.

AUSTRALIAN AIRCRAFT AND STEEL ENGINEERING CO., LTD. (*Now defunct*).

Union House, Sydney. Aerodrome and works : Mascot.

Built six Avro 504Ks for the R.A.A.F. They completed a six-seater commercial biplane to the designs of Mr. H. E. Broadsmith, F.R.Ae.S.

This machine was constructed entirely by Australian labour and with Australian timber and material. It has been taken over by the Commonwealth Government and is to be fitted with a Rolls Royce "Eagle IX" engine. The A. A. & E. Co., Ltd., have now gone into voluntary liquidation, owing to lack of support from the Government, which is setting up its own aircraft factory.

Specification.

Span	**45 ft.**
Chord	**6 ft.**
Gap	**6 ft.**
Length	**31 ft. 6 in.**
Height	**11 ft.**
Span of tail	**13 ft.**
Chord	**2 ft. 9 in.**
Chord of elevators	**2 ft. 6 in.**
Engine	**400 h.p. Liberty.**
Weight empty	**2,800 lbs.**
Weight loaded	**4,365 lbs.**
Weight per sq. ft.	**8.7 lbs.**
Weight per h.p.	**10.9 lbs.**
Maximum speed	**116 m.p.h.**
Cruising speed	**100 m.p.h.**
Landing speed	**45-48 m.p.h.**
Climb	**6,000 ft. in 9½ mins.**

THE R.A.A.F. EXPERIMENTAL STATION.

Randwick, Sydney.

An Australian Royal Air Force Experimental Station has been established at Randwick, Sydney. The technical staff at Randwick is under the supervision of Sqdn. Ldr. L. J. Wackett, D.F.C., A.F.C., B.Sc., A.F.R.Ae.S., R.A.A.F., with Mr. H. E. Broadsmith, recently with the late Australian Aircraft and Engineering Co., as chief civilian engineer.

Randwick will be a small experimental aircraft factory, but quantity production will not be attempted. Designs will be evolved, experimentally developed and tested up to the point of production.

Considerable importance is attached to the development of the light aeroplane and experimental work in this connection will be undertaken upon the arrival of suitable engines.

The first machine to be built at Randwick is the Wackett "Widgeon" amphibian flying-boat which is now under construction. Among the special features embodied in the "Widgeon" are folding wings, all-metal ribs, accessibility of the engine, interchangeable planes and struts, protection of airscrew from spray, tropical radiator and detachable undercarriage.

No plywood or glue will be used, the hull will be void of tanks or pipe lines, and the machine will carry its own dinghy and lifeboat. Accommodation will be provided for pilot, three passengers, 100 lbs. mail matter and 60 lbs. of personal luggage. The maximum speed will be 90 m.p.h. with a cruising speed of 70 m.p.h.

CANADA.

R.A.F.

It is reported that six Avro "Viper" seaplanes are being constructed at the Camp Borden station of the Royal Canadian Air Force for forest fire patrol work. It is, however, probable that this report really refers to the assembly of machines and not to their construction.

LAURENTIDE AIR SERVICE.

Grand Mere, Quebec.

This firm is preparing to manufacture aircraft for its own purposes, and engaged Major D. C. M. Hume, late of the Air Ministry Technical Department, as designer. Major Hume appears, however, to have joined the Royal Canadian Air Force.

VICKERS.

Vickers Works, Montreal.

These works have undertaken the construction of eight Vickers "Vikings" in Canada for the Canadian Air Force.

Mr. C. H. Reid, lately of the Bristol Aeroplane Co., Ltd., has been engaged as aircraft designer.

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CZECHO-SLOVAKIA.

AERO.

Aero Aircraft Factory, Prague. (Továrna Letadel "Aero" Praha).

SCHOOL TYPE.

This is a two-seat biplane, the design of which is developed from the German "Brandenburg" type, well-known as an excellent plane for school purposes. The machine was described and illustrated fully in the 1922 volume.

THE AERO SINGLE-SEAT SCOUT.

The Aéro Works of Prague have produced a small single-seater fighter biplane designed by MM. Husnik and Vlasak. The machine is very "Spad-ish" in appearance. The fuselage is of steel construction, fabric covered, and is fitted with a 220 h.p Hispano-Suiza engine which is entirely carried inside the cowling. The main petrol tank is carried on the axle in a manner similar to that found in the later Fokker biplanes. The planes having a loading of 54 kgs. per sq. metre are of orthodox construction, the interplane struts being of C-shape. The useful load is 320 kgs., and the weight per h.p. 3.95 kgs.

THE AERO 10.

This is a five-seater cabin machine, and as such is the first Czecho-Slovak commercial aeroplane.

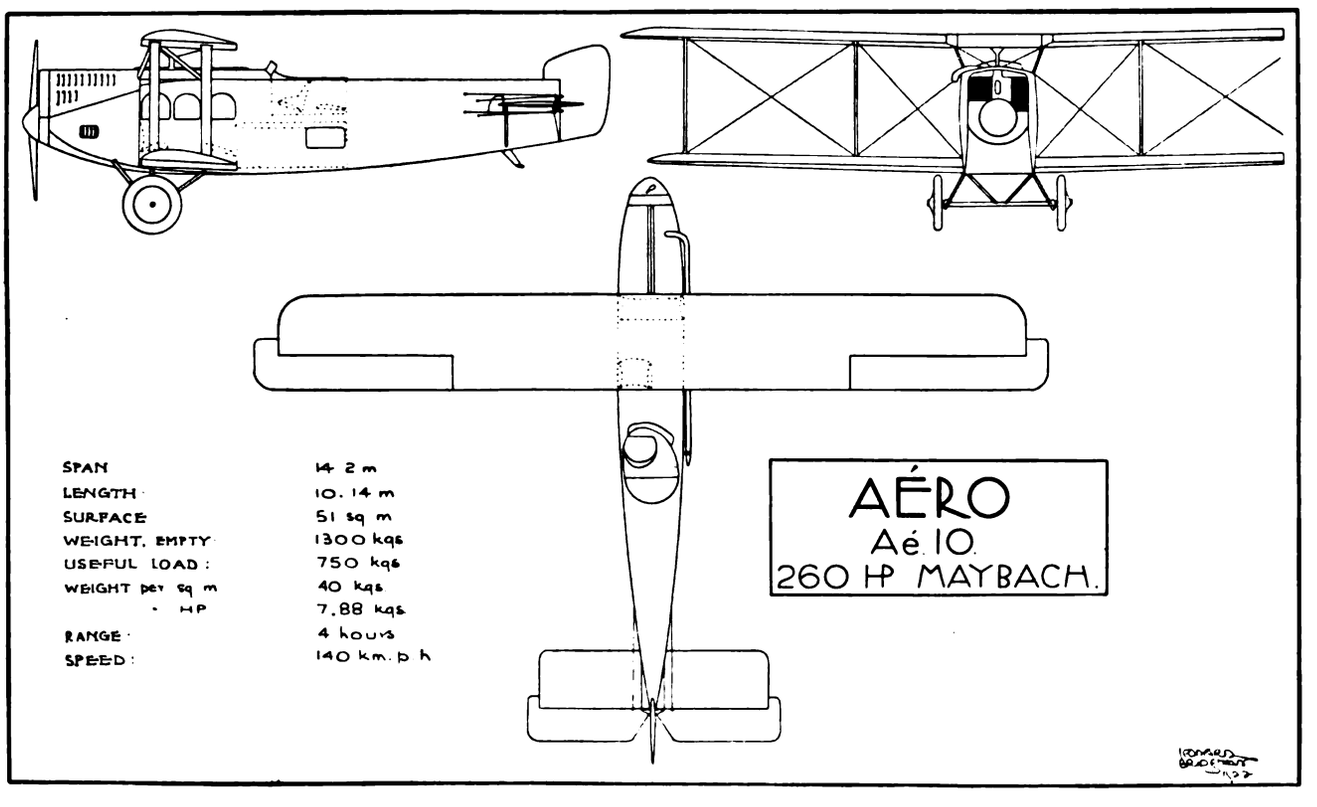
Construction of these machines was begun in 1921. The machine can be fitted with any six-cylinder engine from 260-350 h.p., and is actually fitted with a 260 h.p. Maybach Mb. III, a number of which were left in the country by the Germans.

The passenger cabin is carried between the planes and is isolated from the engine by a fireproof bulkhead. It has accommodation for five passengers. Behind the cabin is a luggage compartment. Above this compartment is the pilot's cockpit with accommodation for pilot and mechanic.

The principal dimensions are shown on the scale drawing in metric units. The British equivalents are :—

The "Aero" 10 (260 h.p. Maybach).

Span	**46 ft. 7 in.**
Length ..	**33 ft. 3 in.**
Surface ..	**550 sq. ft.**
Weight empty	**2,860 lbs.**
Useful load ..	**1,650 lbs. (including crew and fuel).**
Wing loading ..	**8.2 lbs./sq. ft.**
Power loading	**17.3 lbs./h.p.**
Speed	**86 m.p.h.**



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AERO—*continued.*

The Aero 18 Single-seat Fighter (240 h.p. Walter engine).

THE AERO 18.

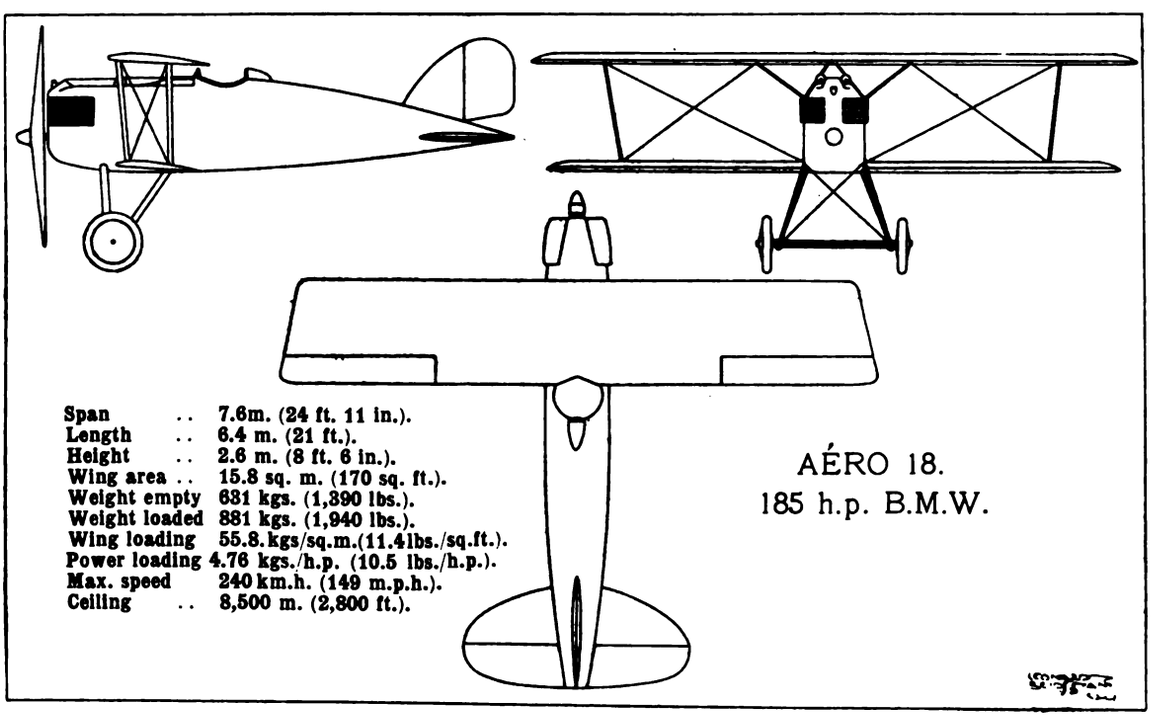
A single-seat fighter of conventional biplane type, fitted with the B.M.W. IIIA engine. The fuselage is of steel tube construction. Two synchronized machine guns firing through the airscrew are fitted. A scale drawing and a photograph are reproduced.

AVIA.

The Avia Co. appears to have been taken over by Milos Bondy & Co., Prague VII/799.

THE AVIA B.H.I. SPORTING MACHINE.

At the Prague Aero Show for 1920 a small monoplane, somewhat reminiscent of the Junkers monoplane, attracted a certain amount of attention. This was the Avia B.H. monoplane, designed by MM. Benes and Hajn, illustrated and described in the 1922 edition.


Span .. 7.6m. (24 ft. 11 in.).
Length .. 6.4 m. (21 ft.).
Height .. 2.6 m. (8 ft. 6 in.).
Wing area .. 15.8 sq. m. (170 sq. ft.).
Weight empty 631 kgs. (1,390 lbs.).
Weight loaded 881 kgs. (1,940 lbs.).
Wing loading 55.8. kgs/sq.m.(11.4 lbs./sq.ft.).
Power loading 4.76 kgs./h.p. (10.5 lbs./h.p.).
Max. speed 240 km.h. (149 m.p.h.).
Ceiling .. 8,500 m. (2,800 ft.).
AÉRO 18.
185 h.p. B.M.W.

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***AVIA**—continued.*

AVIA B.H. 9 & 10.

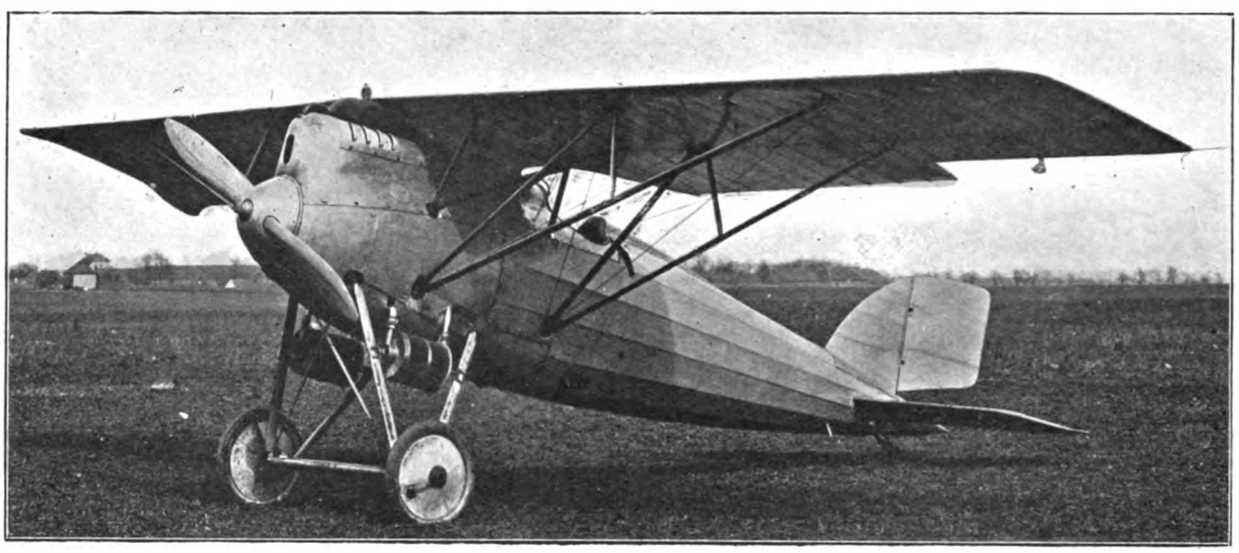
This is a small monoplane, built either as a single-seater or a two-seater for school and sporting purposes. It is fitted with the Walter 60 h.p. air-cooled radial engine of indigenous manufacture.

Specification.

Span	**9.72 m. (31 ft. 10 in.).**
Length	**6.64 m. (21 ft. 9 in.).**
Height	**2.53 m. (8 ft. 4 in.).**
Wing area	**13.6 sq. m. (147 sq. ft.).**
Weight empty	**345 kgs. (760 lbs.).**
Weight loaded	**550 kgs. (1,210 lbs.).**
Wing loading	**40.4 kgs./sq. m. (8.25 lbs./sq. ft.).**
Power loading	**9.2 kgs./h.p. (20 lbs./h.p.).**
Max. speed	**157 km.h. (98 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**3 mins. 5 secs.**
Ceiling	**4,000 m. (13,120 ft.).**

MILITARY AIRCRAFT WORKS. Prague.

(Vojenská Továrna na Letadla, Praha-Kbely).



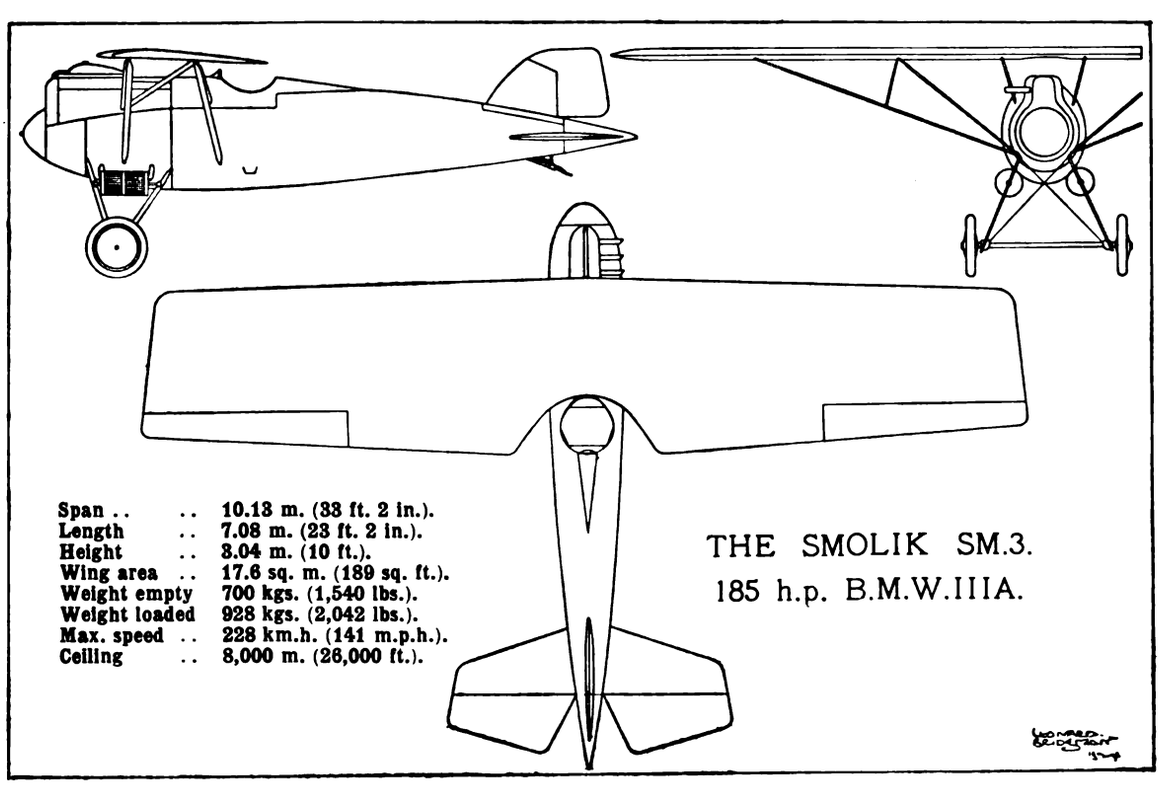
The Smolik SM.3.

MILITARY BIPLANE SM.1.

The military two-seat biplane "Sm.1" designed by Mr. A. Smolik and built by Military Aircraft Works, in June, 1920, and the similar SM.II were described in the 1922 edition.

THE SM.3.

A single-seat fighter monoplane, fuselage of welded steel tubes, wings of normal timber construction. Rigid steel tube wing bracing is used. The tail unit is of steel tube framing, entirely unbraced.


Span .. .. 10.13 m. (33 ft. 2 in.).
Length .. 7.08 m. (23 ft. 2 in.).
Height .. 3.04 m. (10 ft.).
Wing area .. 17.6 sq. m. (189 sq. ft.).
Weight empty 700 kgs. (1,540 lbs.).
Weight loaded 928 kgs. (2,042 lbs.).
Max. speed .. 228 km.h. (141 m.p.h.).
Ceiling .. 8,000 m. (26,000 ft.).
THE SMOLIK SM.3.
185 h.p. B.M.W.IIIA.

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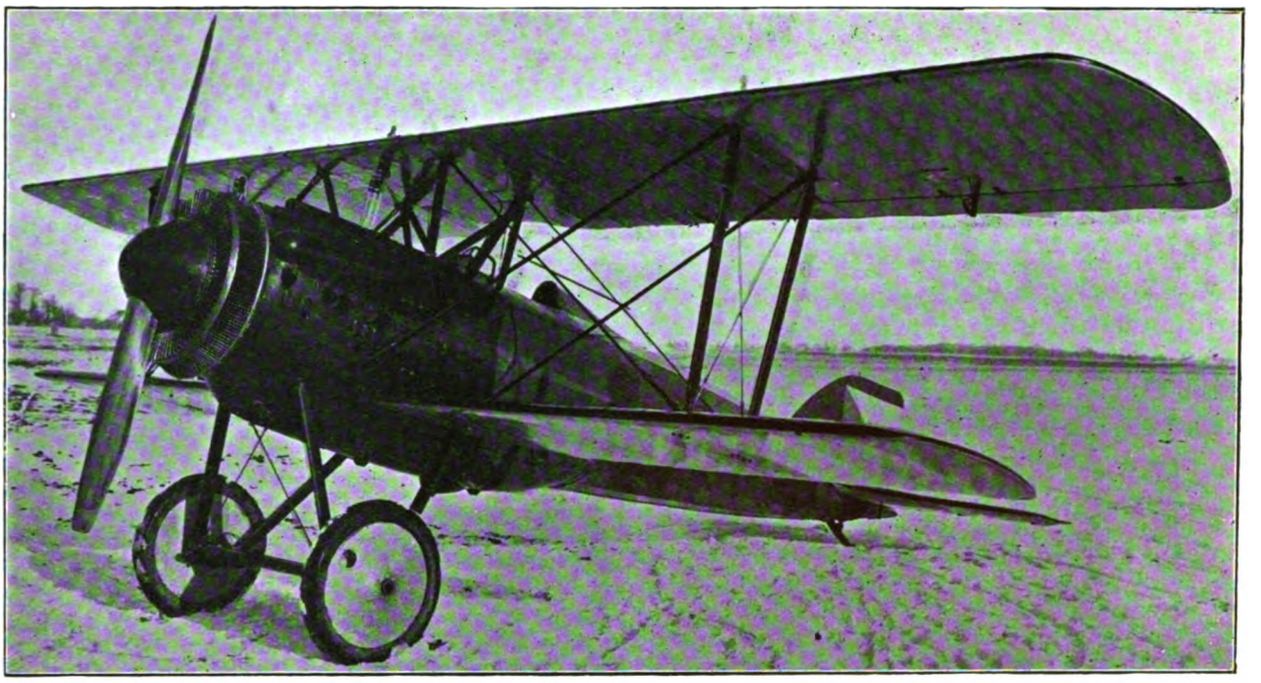
MILITARY AIRCRAFT WORKS—*continued.*



The Smolik SM.4.

THE SM.4.

A biplane single-seater fighter with 200 h.p. Hispano-Suiza. The lower wing is of smaller span than the upper. General construction is as the SM.3, steel tube fuselage, wooden wings, etc.

Specification.

Span	**8.0 m. (25 ft. 1 in.).**
Length	**6.58 m. (21 ft. 7 in.).**
Height	**2.62 m. (8 ft. 7 in.).**
Wing area	**15.9 sq. m. (171 sq. ft.).**
Weight empty	**673 kgs. (1,580 lbs.).**
Weight loaded	**980 kgs. (2,156 lbs.).**
Wing loading	**61.5 kgs./sq. m. (12.6 lbs./sq. ft.).**
Power loading	**4.5 kgs./h.p. (10 lbs./h.p.).**
Max. speed	**232 km.h. (141 m.p.h.).**
Ceiling	**6,200 m. (20,000 ft.).**

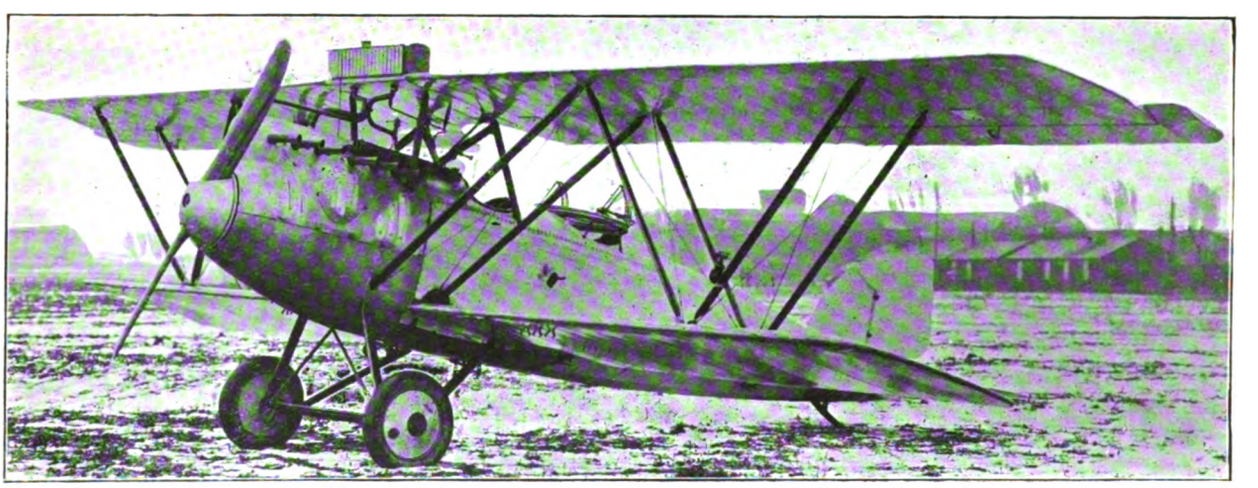
THE SM.5.

A two-seater reconnaissance machine with the 230 h.p. Hiero engine. Characterized by the interplane bracing of rigid steel tubes.

THE SM.6.

This is a two-seat bomber, characterized by the fact that despite its very considerable span it has but one row of struts on each side. It has a wing of the Jonkeroski type, and the use of this type of section allows of very deep wing spars and of very long bracing bays.

Here again steel tube framing is used for fuselage, the tail is of mixed steel and duralumin, and timber is used for the wings. Petrol tanks and radiators are carried on the lower wings. The engine is a 260 h.p. Maybach.



The SM.5. (230 h.p. Hiero engine).

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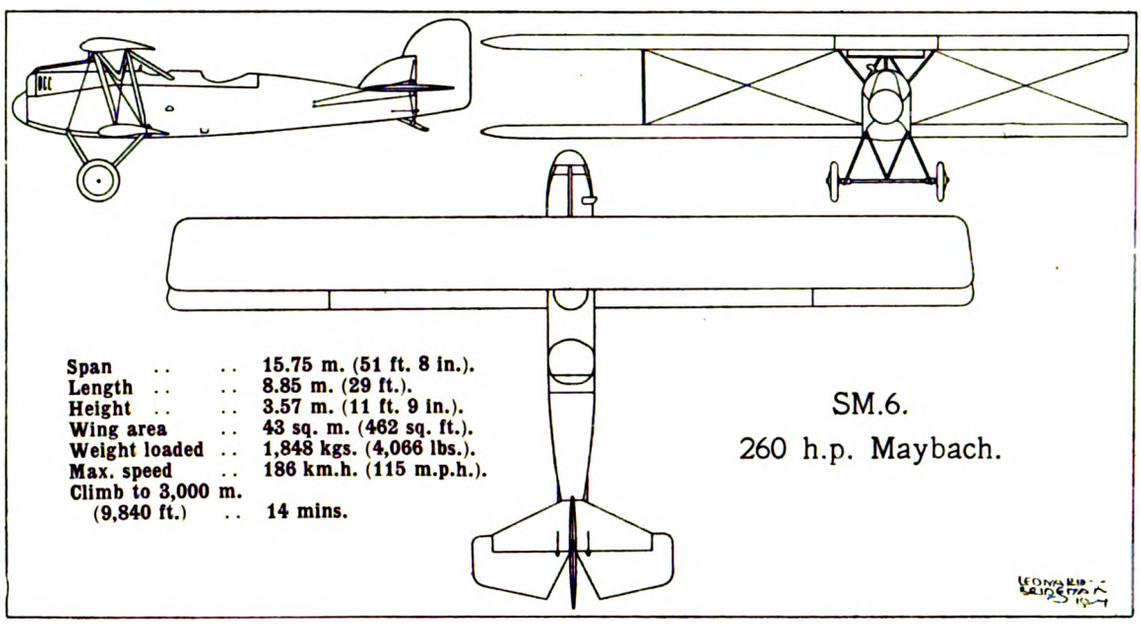
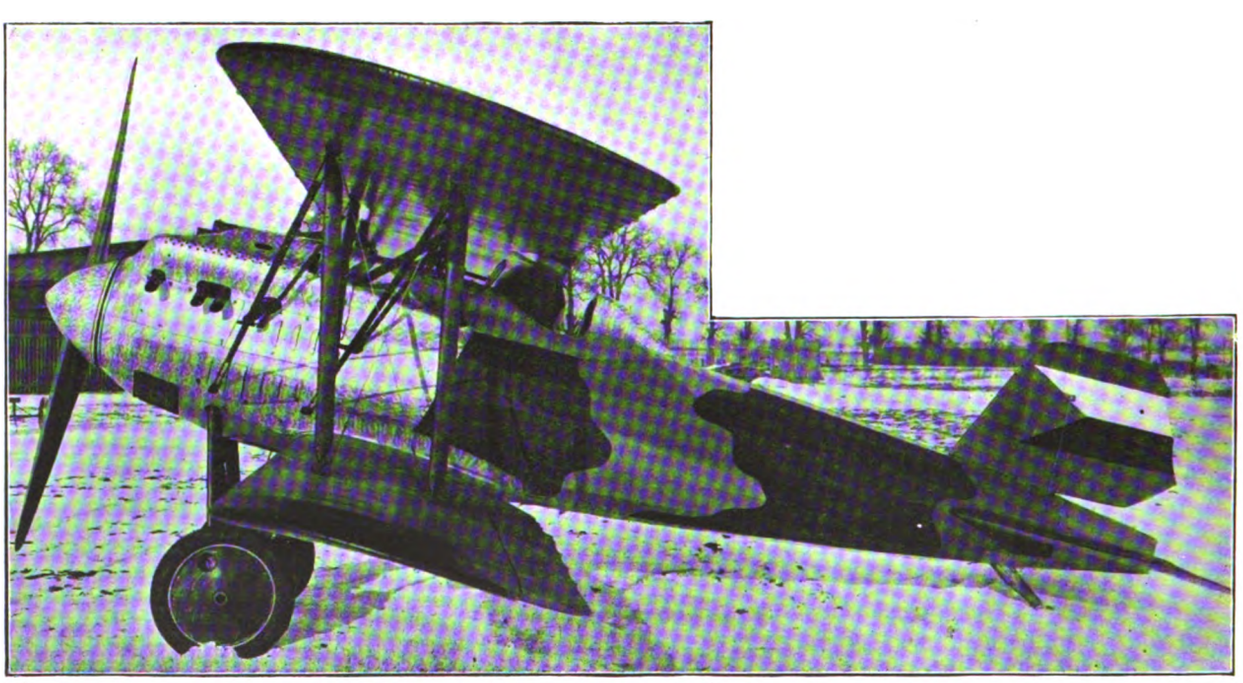
MILITARY AIRCRAFT WORKS—*continued.*



Span	.. ..	15.75 m. (51 ft. 8 in.).
Length	.. ..	8.85 m. (29 ft.).
Height	.. ..	3.57 m. (11 ft. 9 in.).
Wing area	..	43 sq. m. (462 sq. ft.).
Weight loaded	..	1,848 kgs. (4,066 lbs.).
Max. speed	..	186 km.h. (115 m.p.h.).
Climb to 3,000 m. (9,840 ft.)	..	14 mins.

SM.6.
260 h.p. Maybach.



The SM7. A Single-seat Fighter with 300 h.p. Hispano-Suiza engine.

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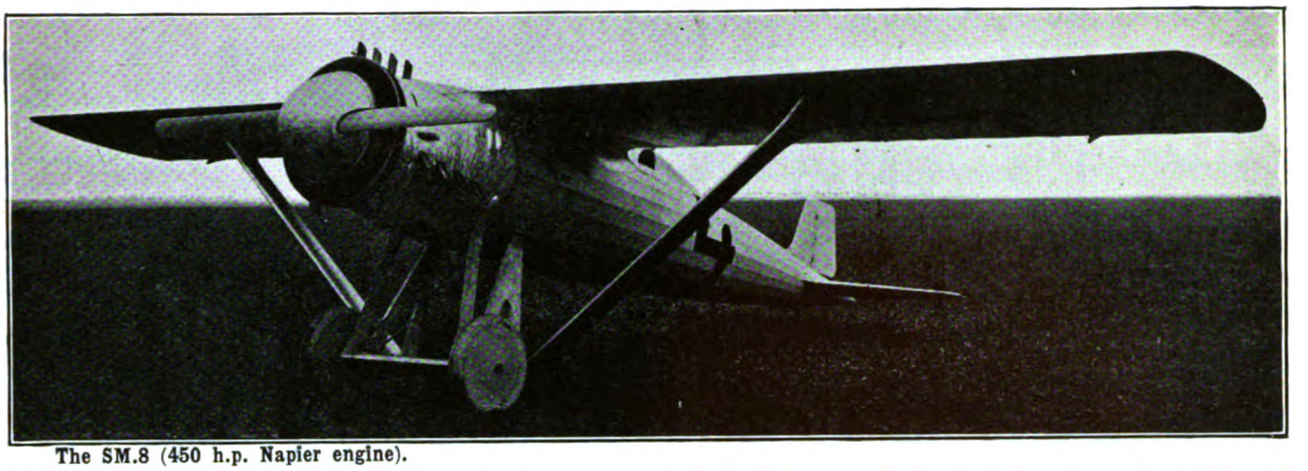
MILITARY AIRCRAFT WORKS—*continued.*



The SM.8 (450 h.p. Napier engine).

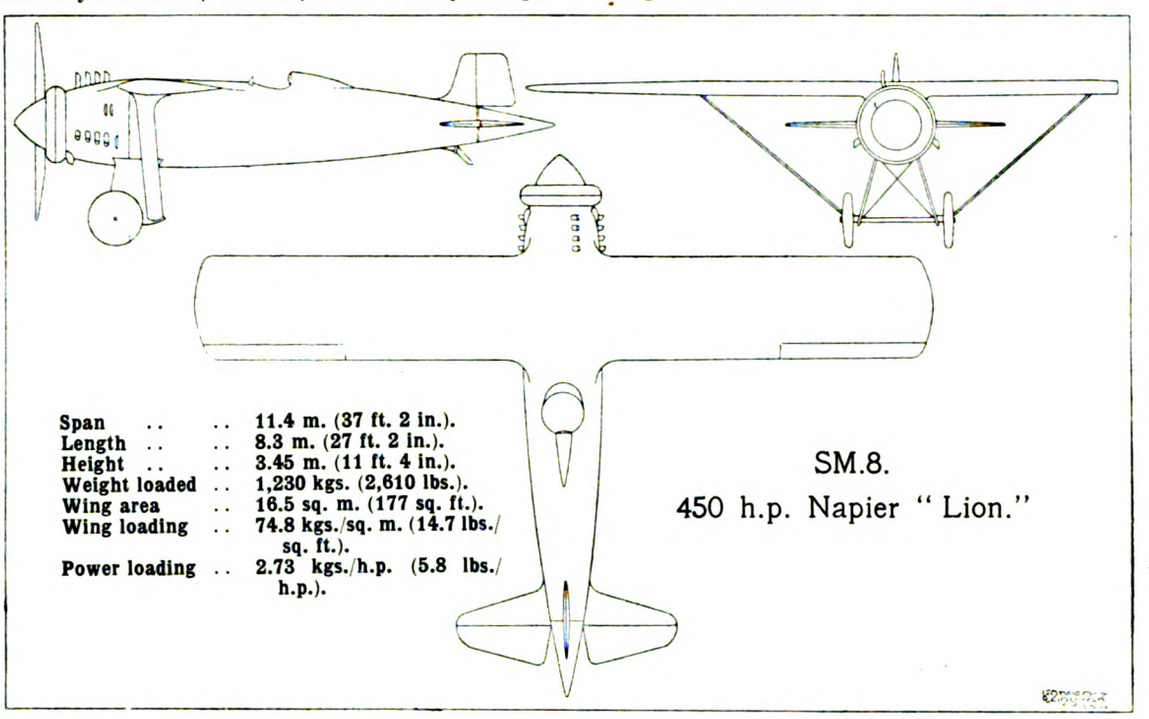
THE SM.8.

A rigidly-braced racing monoplane with the Napier "Lion" engine. The fuselage is of steel and duralumin tubes of excellent streamline shape. The radiator is annular, fitted round the cowling, just behind a large spinner, and the engine is completely enclosed.

The wings are of wooden construction covered with plywood. The section is symmetrical (bi-convex) and braced by a single "I" strut on each side to the undercarriage. The pilot's seat is very far aft in the fuselage, but he probably has quite a good view for landing below the wing.

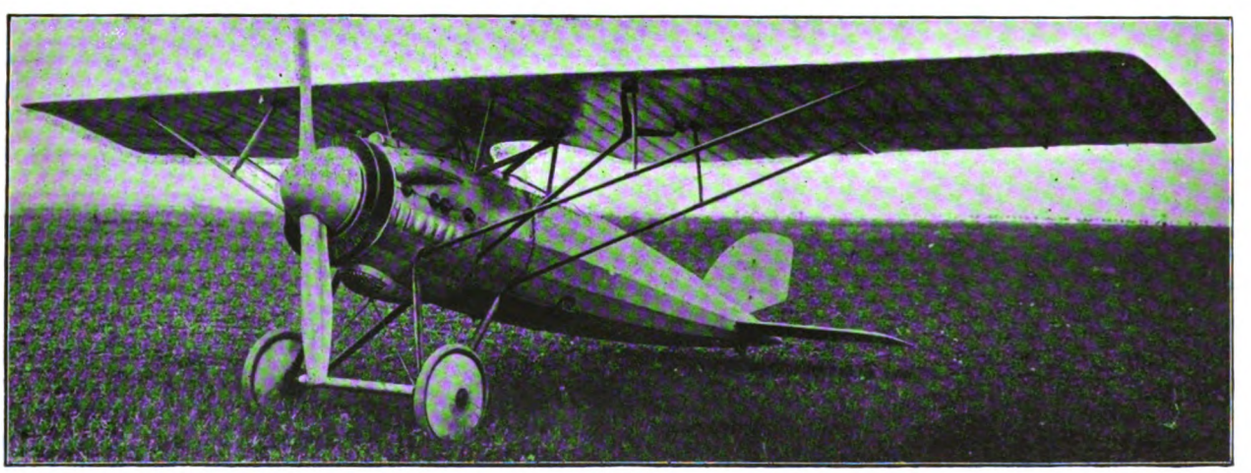
The tail units are of timber construction.

On trials a speed of 360 km.h. (221 m.p.h.) and a landing speed of 130 km.h. (81 m.p.h.) is reported to have been attained, but the accidental dropping of the engine during modifications has interrupted further trials.



Span	.. ..	11.4 m. (37 ft. 2 in.).
Length	.. ..	8.3 m. (27 ft. 2 in.).
Height	.. ..	3.45 m. (11 ft. 4 in.).
Weight loaded	..	1,230 kgs. (2,610 lbs.).
Wing area	..	16.5 sq. m. (177 sq. ft.).
Wing loading	..	74.8 kgs./sq. m. (14.7 lbs./sq. ft.).
Power loading	..	2.73 kgs./h.p. (5.8 lbs./h.p.).

SM.8.
450 h.p. Napier "Lion."



The SM.12, a combination of SM.4 fuselage with SM.3 wings.

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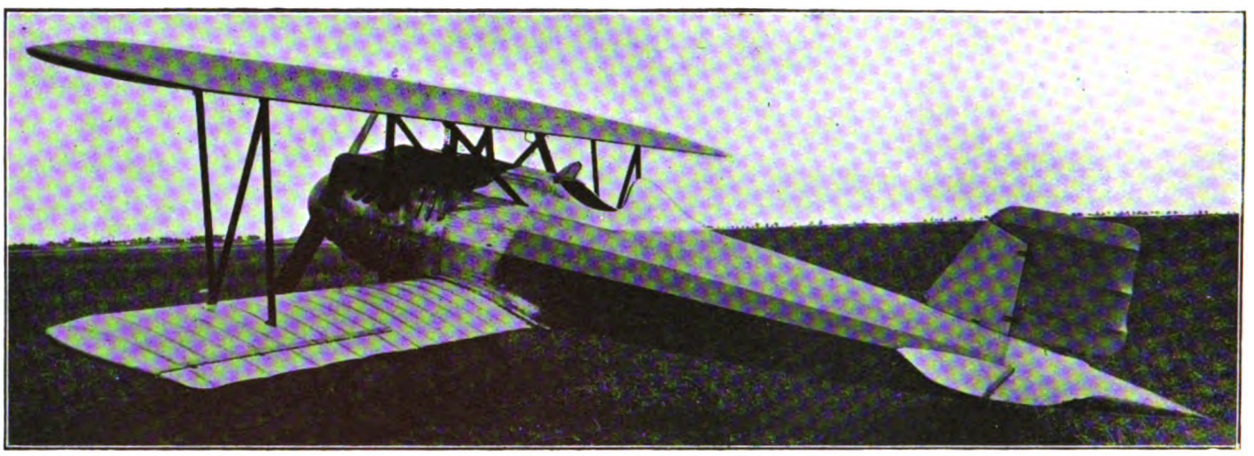
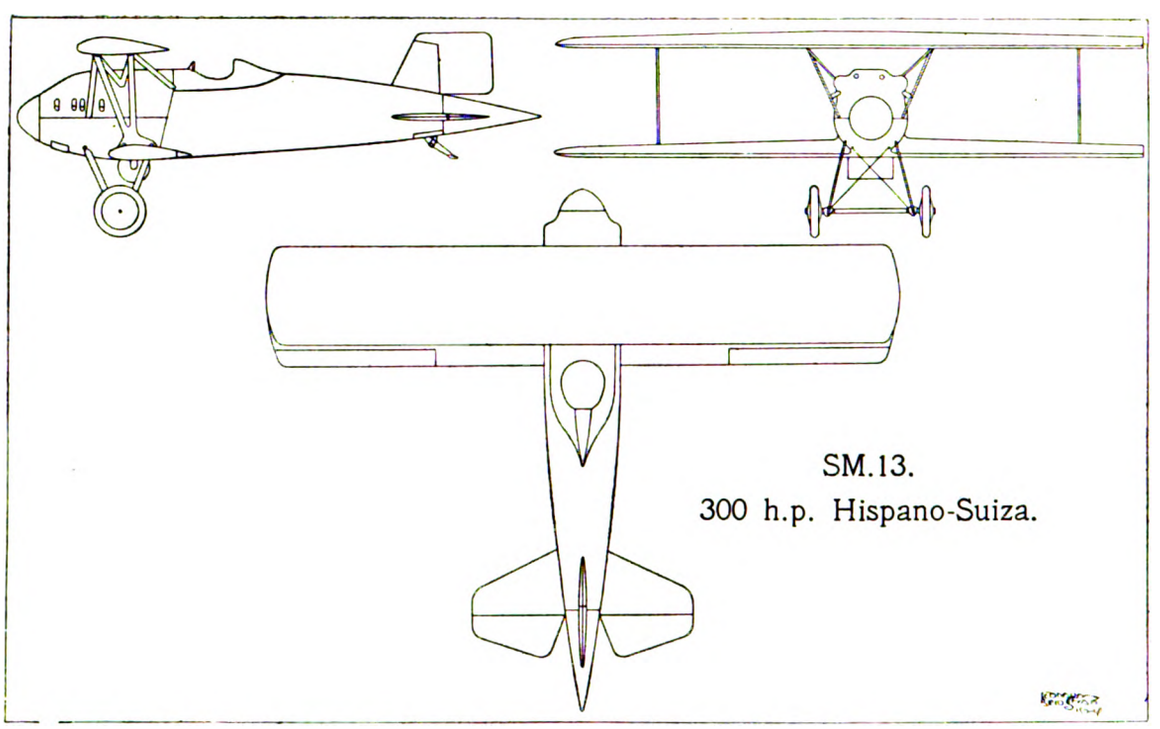
MILITARY AIRCRAFT WORKS—*continued.*



The SM.13 Single-seat Fighter (300 h.p. Hispano-Suiza engine).

THE SM.13.

A single-seat fighter of the cantilever biplane type, fitted with the 300 h.p. Hispano-Suiza engine. The steel and duralumin tube fuselage is carefully streamlined and ends in a large tail projecting past the rudder and elevators. One row of interplane struts on each side are fitted to guard against wing torsion troubles. The machine is shown in a photograph and an outline drawing, but dimensions, etc., are not available.



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FINLAND.

THE FINNISH GOVERNMENT AIRCRAFT WORKS.

At the beginning of November, 1922, a trial flight was made with the first machine built at home. This is of the German Hansa-Brandenburg W.33 type, with a 300 h.p. Fiat engine.

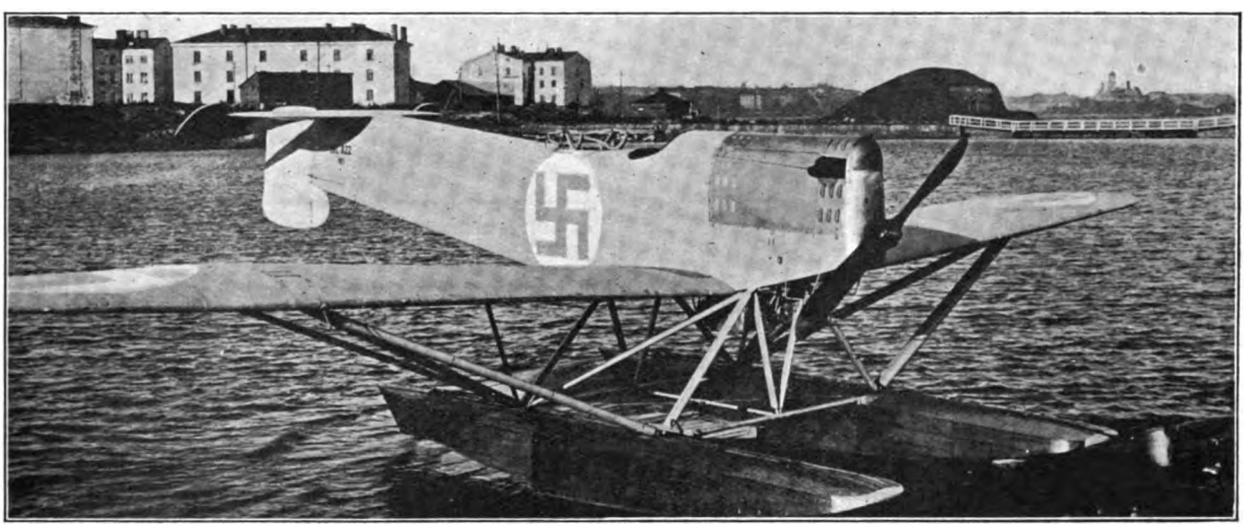
Some of the machine's characteristics are as follows :—

Span	**15.85 m. (52 ft.).**
Height	**3.37 m. (11 ft.).**
Length	**11.1 m. (36 ft. 5 in.).**
Wing area	**44 sq. m. (462 sq. ft.).**
Weight light	**1,470 kgs. (3,234 lbs.).**
Weight loaded	**2,100 kgs. (4,620 lbs.).**
Engine	**300 h.p. Fiat.**
Wing loading	**47.7 kgs./sq. m. (10 lbs./sq. ft.).**
Power loading	**7 kgs./h.p. (15.4 lbs./h.p.).**
Speed	**170 km.h. (105 m.p.h.).**
Climb to 3,000 m. (9,840 ft.)	**22 mins.**

The Aircraft Works, which was founded in the early spring of 1921, owns now quite up-to-date working machinery and exceedingly capable Finnish workmen. The delay in the completion of the first machine was, to a great extent, due to the careful testing and inspecting which the home material, especially the timber, underwent. Satisfactory results have, however, already been arrived at, and therefore the status of the home aircraft industry can be regarded as safe.

In connection with this, mention may be made of the Finnish plywood, which has gained recognition and has even been used abroad. This article has been exported annually in great quantities (1921, about 6,500 tons, and 1922, about 15,000 tons), especially to England.

Since the trial flight of the first machine, serial manufacture has been started, and it is calculated that the works in the future will be able to supply the entire demand of the Air Forces. At first, hydro-aeroplanes only will be built.



The First Finnish-built Aircraft. Of Hansa-Brandenburg Type (300 h.p. Fiat engine).

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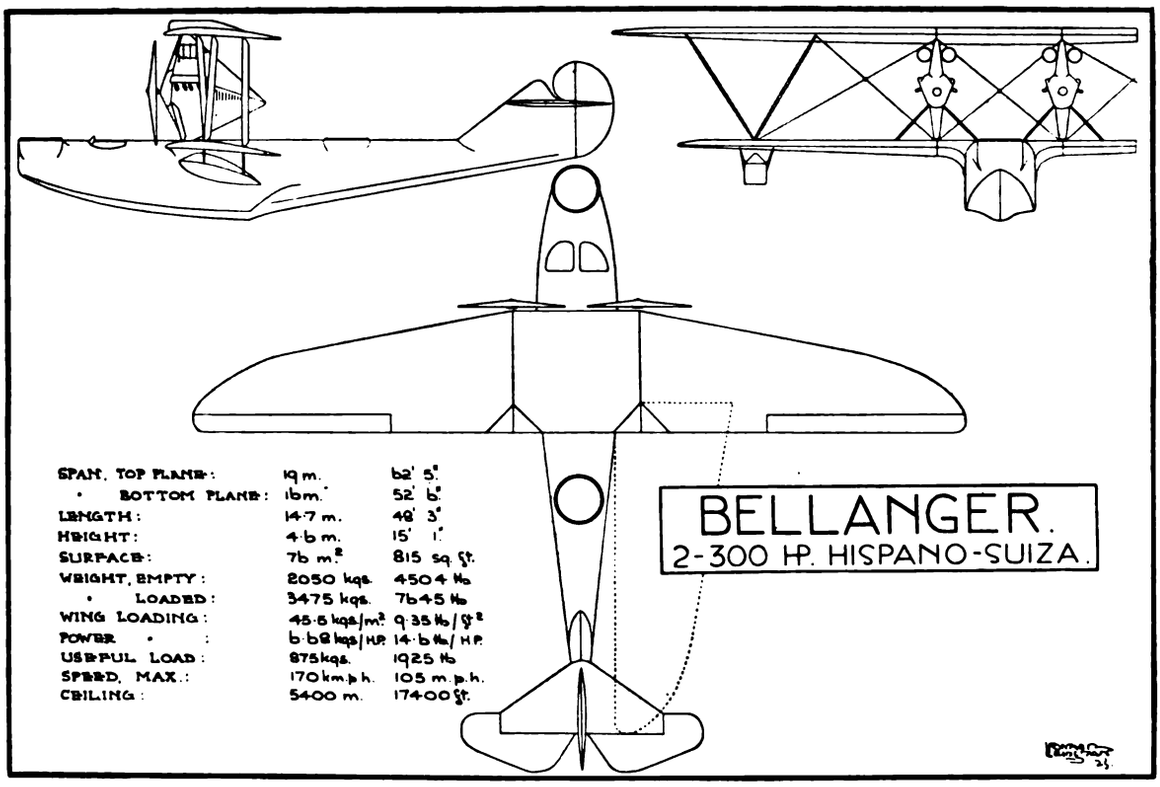
FRANCE.

BELLANGER FRERES.

B


BELLANGER.
2-300 HP. HISPANO-SUIZA.
SPAN. TOP PLANE: 19 m. 62' 5"
BOTTOM PLANE: 16 m. 52' 6"
LENGTH: 14·7 m. 48' 3"
HEIGHT: 4·6 m. 15' 1"
SURFACE: 76 m² 815 sq. ft.
WEIGHT, EMPTY: 2050 kgs. 4504 lbs.
LOADED: 3475 kgs. 7645 lbs.
WING LOADING: 45·6 kgs/m² 9·35 lbs/ft²
POWER: 6·62 kgs/H.P. 14·6 lbs/H.P.
USEFUL LOAD: 875 kgs. 1925 lbs.
SPEED, MAX.: 170 k.m.p.h. 105 m.p.h.
CEILING: 5400 m. 17700 ft.

1/35 Route de la Revolte, Paris.

This great firm of motor-car builders produced in 1922 a flying-boat built to the designs of M. Denhaut, the real pioneer of flying-boats in France, and the originator of the once-famous Donnet-Denhaut. It has two Hispano-Suiza engines fixed in very prettily designed housings each with two Lamblin radiators outside it. The wings fold back outside the engine-housings and the leading edge sweeps back sharply from the junction with the fixed portion of the leading edge. The trailing edge is straight all along.

The hull is remarkable for not having any step, and merely a sharp edge where the bottom of the boat proper ends and the fuselage part sweeps up steeply to the tail. This may make it difficult to get off smooth water but may on the other hand make the machine faster in the air. The forward gunner is perched in a species of band-box in the extreme nose of the boat, where he will certainly have a clear field of fire.

The firm has a number of other types in the design stage, but they have not yet publicly emerged from that state.

BERNARD. (S.I.M.B.)

Société Industrielle des Métaux et du Bois, Rue Villot, La Courneuve, Seine.

The firm of A. Bernard was established during the latter part of the War, whose designs failed to mature till the conclusion of hostilities. The firm built, in 1919, a twin-engine machine with 2—180 h.p. Hispano engines, described in "All the World's Aircraft" for 1920.

The title of the firm has since been changed as above.

The all-metal single-seater described in the last issue does not appear to have passed the exhibition condition. A somewhat similar machine, with 450 h.p. Lorraine Dietrich engine and a retractable undercarriage is projected for the Coupe Beaumont race.

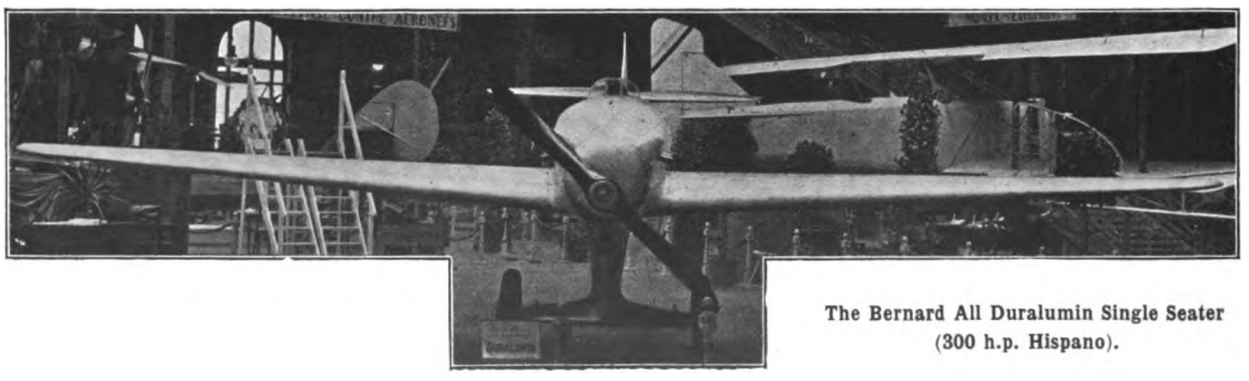
Specification of the Bernard Racer.

Span	**11 m. (36 ft. 1 in.).**
Length	**6.93 m. (22 ft. 9 in.).**
Height	**2.73 m. (8 ft. 11 in.).**
Chord	**2.3 m. to 1.56 m. (7 ft. 6 in. to 5 ft. 1½ in.).**
Wing area	**19 sq. m. (204 sq. ft.).**
Weight loaded	**1,250 kgs. (2,750 lbs.).**
Engine	**Lorraine-Dietrich, 450 h.p.**
Wing loading	**66 kgs./sq. m. (13.5 lbs./sq. ft.).**
Power loading	**2.78 kgs./h.p.**

THE BERNARD TYPE M.

A three-engined five-seater for bombing escort duties, projected but not yet built. The design contemplates an all-metal twin fuselage cantilever monoplane. Each fuselage carries an engine driving a tractor airscrew. In addition, a central nacelle, with the third engine, and a pusher airscrew is fitted. In the nose of the nacelle a pair of machine-guns are mounted on a ring mount. Behind these is a cockpit for two pilots. Behind the wing in each of the fuselages there are further gun cockpits.

The machine has a span of 31.6 m. (103 ft.) and approximately 155 sq. m. (1,650 sq. ft.), so that it may be assumed that somewhat acute structural difficulties may be encountered in its production.



The Bernard All Duralumin Single Seater (300 h.p. Hispano).

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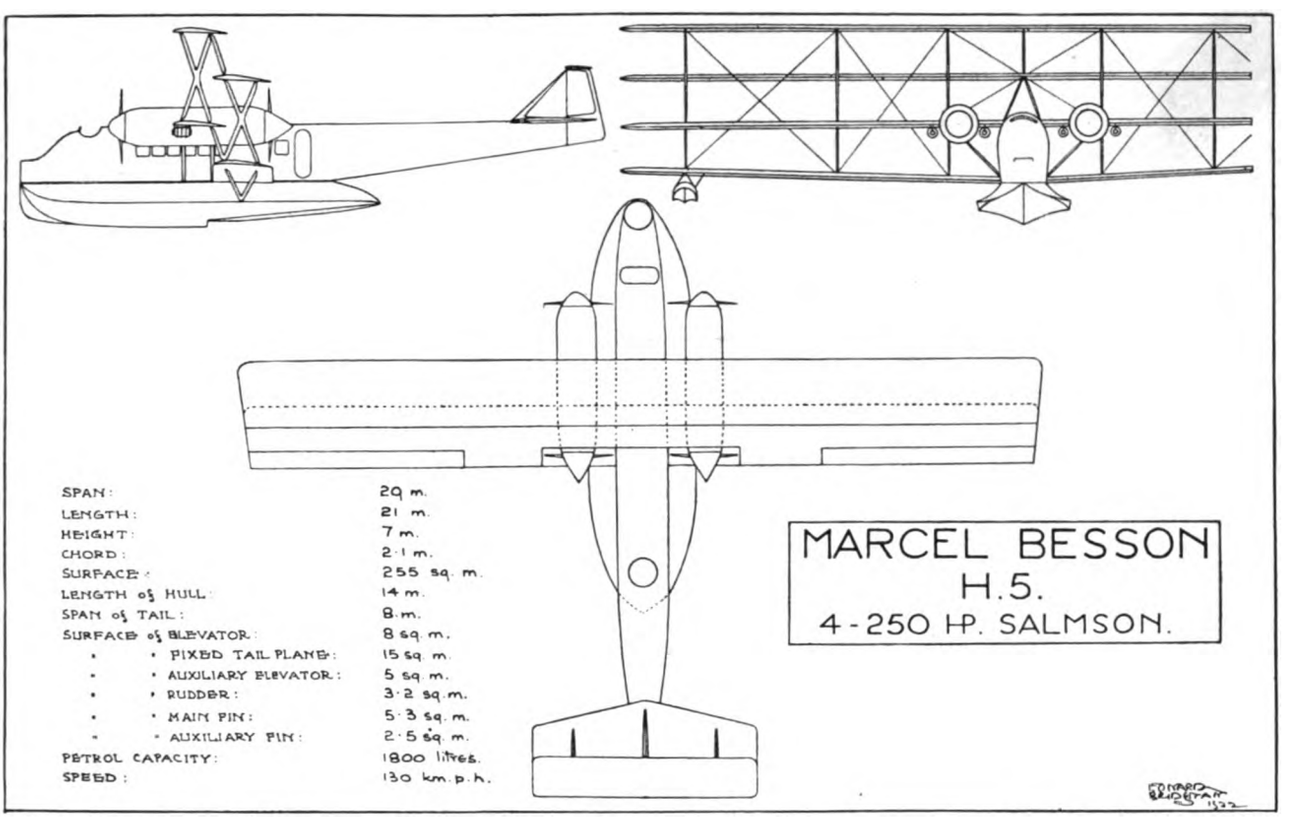
BESSON.

Société des Constructions Aéronautiques et Navales Marcel Besson, Rue St. Denis 5, Boulogne-sur-Seine.

Specialize in the construction of flying boats, and have produced some of the best craft of this type yet made in France.

THE BESSON QUADRUPLANE.

This machine, shown in model form in the 1921 Paris Salon, has now been completed and delivered to the seaplane experimental station at St. Raphael for test.


SPAN: 20 m.
LENGTH: 21 m.
HEIGHT: 7 m.
CHORD: 2·1 m.
SURFACE: 255 sq. m.
LENGTH of HULL: 14 m.
SPAN of TAIL: 8 m.
SURFACE of ELEVATOR: 8 sq. m.
" " FIXED TAIL PLANE: 15 sq. m.
" " AUXILIARY ELEVATOR: 5 sq. m.
" " RUDDER: 3·2 sq. m.
" " MAIN FIN: 5·3 sq. m.
" " AUXILIARY FIN: 2·5 sq. m.
PETROL CAPACITY: 1800 litres.
SPEED: 130 km. p. h.
MARCEL BESSON
H.5.
4-250 HP. SALMSON.

In general arrangement the machine is a flying-boat, the hull being constructed in two portions, the fuselage proper being attached to the boat portion in a manner similar to that found on the Saunders "Kittiwake" constructed for the Air Ministry Amphibian Competition of 1920. The wings, although of quadruplane arrangement, are more easily described as being of double biplane form, and consist of four planes of equal span, the top and one from the bottom and the one from the top and the bottom planes forming two unstaggered biplane cellules, these two cellules being set at a heavy stagger to each other. Each cellule has interplane struts of "X" form with short interconnecting struts between the rear top spar and the front spar of the second plane, the front spar of the second plane and the rear spar of the third plane, and the rear spar of the third plane and the front spar of the bottom plane. This arrangement can be seen clearly on the side view on the attached general arrangement drawings. The wings are of normal construction and call for no special comment. The second and bottom wings only have ailerons of small chord and big span which are operated by push and pull rods, all pulleys having been eliminated throughout the control system.

The fuselage portion of the body is entirely separate from the boat, and contains the passenger cabin, pilot's cockpit, and wireless operator's compartment. The fuselage, which is of ordinary construction and fabric-covered, is bolted to the boat portion at ten points of attachment. The boat is built up of three skins of mahogany, riveted and fabric covered, and is divided into 24 watertight compartments. Two small wing-tip floats are mounted under the extremities of the bottom planes.

The engines—four 250 h.p. Salmsons—are mounted on two power eggs, each egg containing two engines driving one tractor and one pusher airscrew. The engines are cooled by four Lamblin radiators, one for each engine, carried underneath the third plane.

The tail unit consists of three vertical and two horizontal surfaces. The centre vertical surface is the rudder, the two smaller surfaces being used to offset the action of one or more of the engines cutting out. Each vertical surface is attached to a fixed fin. The elevator and tail plane are the lower of the horizontal surfaces, the upper surface being used as a trimming plane.

The cabin is of considerable size and has accommodation for 20 seats. Behind the cabin is the wireless operator's cabin. The pilot's cockpit is in front and above the cabin and is fitted with dual control.

The machine has undergone test at St. Raphael with promising results.

BLANCHARD.

Constructions Aéronautiques Blanchard. Office: 86, Boulevard Malesherbes, Paris.

A new firm founded in January, 1923, by M. Blanchard, who had previously designed flying-boats for Georges Levy and later for Farmans. The firm proposes to confine its activities to seaplanes.

Three types of flying-boat have been designed and built during the year 1923. These are:—

(i) Three-seater bomber with two 260 h.p. (low compression) Hispano-suiza engines.

(ii) Commercial flying-boat with two 300 h.p. Hispano-Suiza engines.

(These two machines are really of the same type, differing only in equipment.)

(iii) A single-seat monoplane with a 380 h.p. Gnôme and Rhône-built Bristol "Jupiter" engine. This is intended for racing purposes, and may be entered for the 1924 Schneider Cup race.

Illustrations of these machines will be found on the next page.

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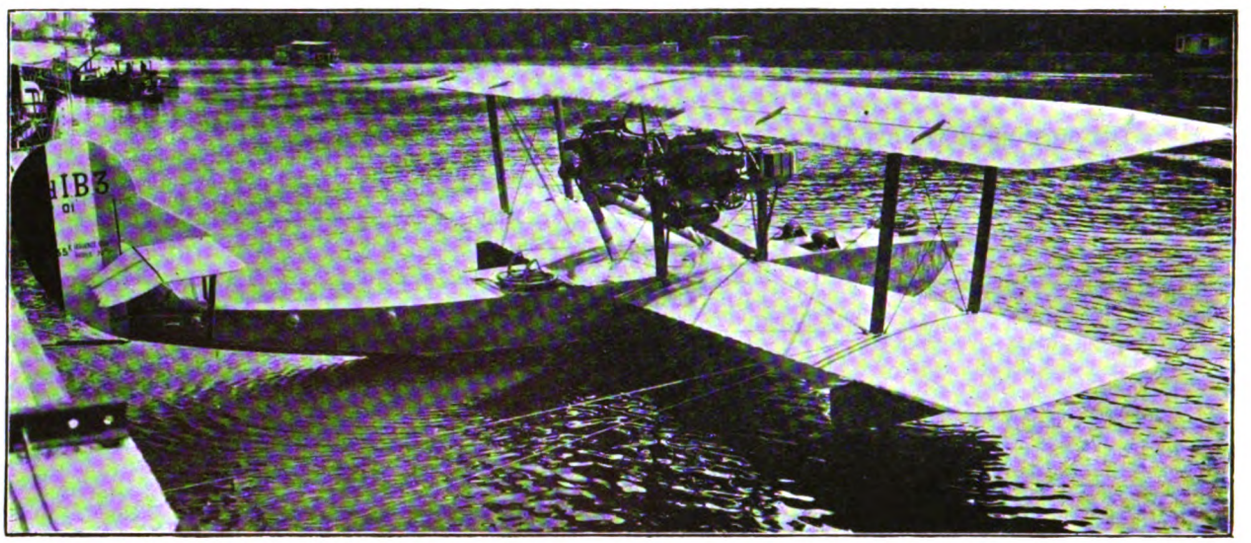
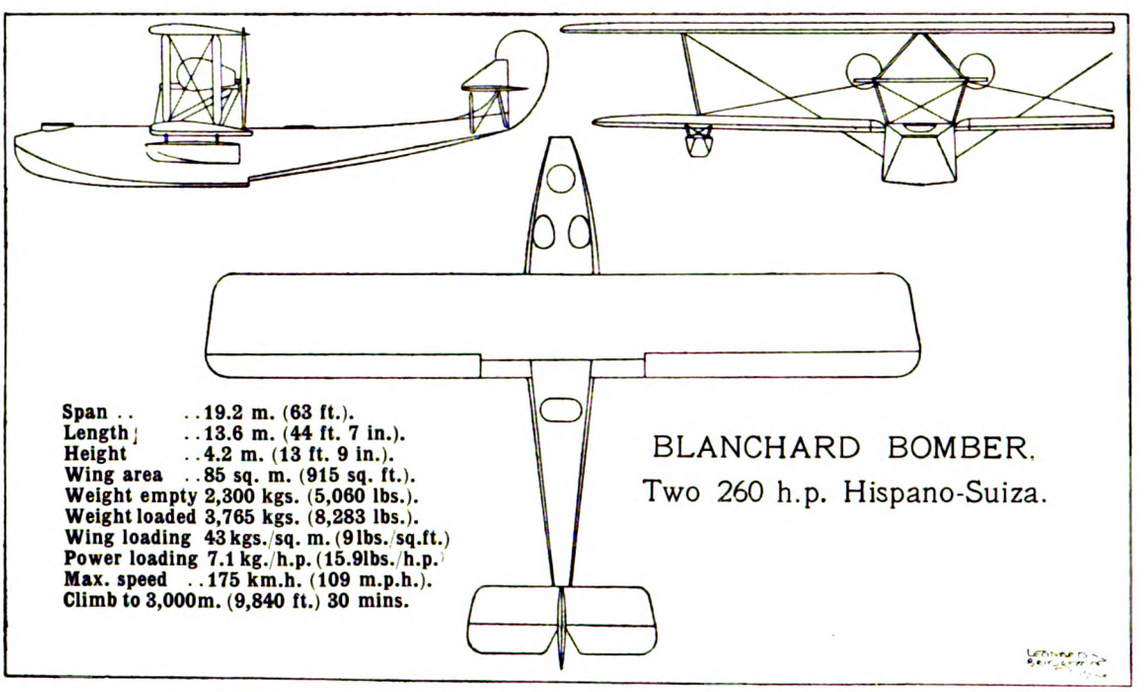
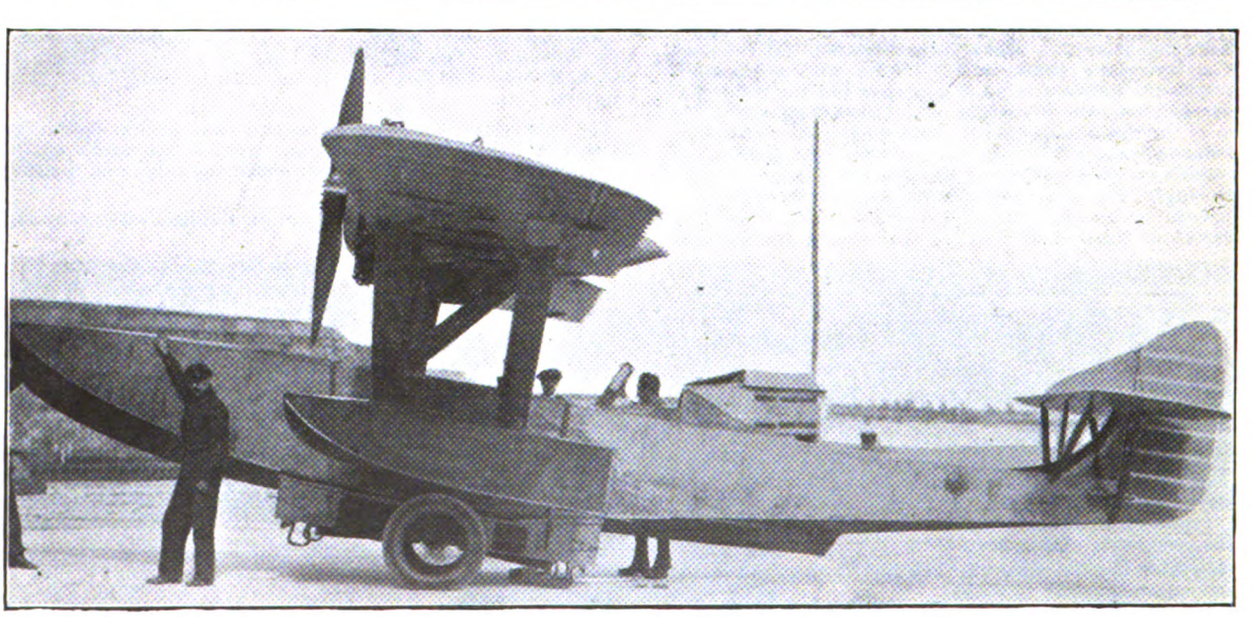
BLANCHARD—*continued.*



The Blanchard Twin-engined Flying-boat.


Span . . . . 19.2 m. (63 ft.).
Length . . 13.6 m. (44 ft. 7 in.).
Height . . 4.2 m. (13 ft. 9 in.).
Wing area . . 85 sq. m. (915 sq. ft.).
Weight empty 2,300 kgs. (5,060 lbs.).
Weight loaded 3,765 kgs. (8,283 lbs.).
Wing loading 43 kgs./sq. m. (9 lbs./sq.ft.)
Power loading 7.1 kg./h.p. (15.9 lbs./h.p.)
Max. speed . . 175 km.h. (109 m.p.h.).
Climb to 3,000 m. (9,840 ft.) 30 mins.
BLANCHARD BOMBER.
Two 260 h.p. Hispano-Suiza.



The Blanchard Racing Flying-boat (400 h.p. "Jupiter" engine).

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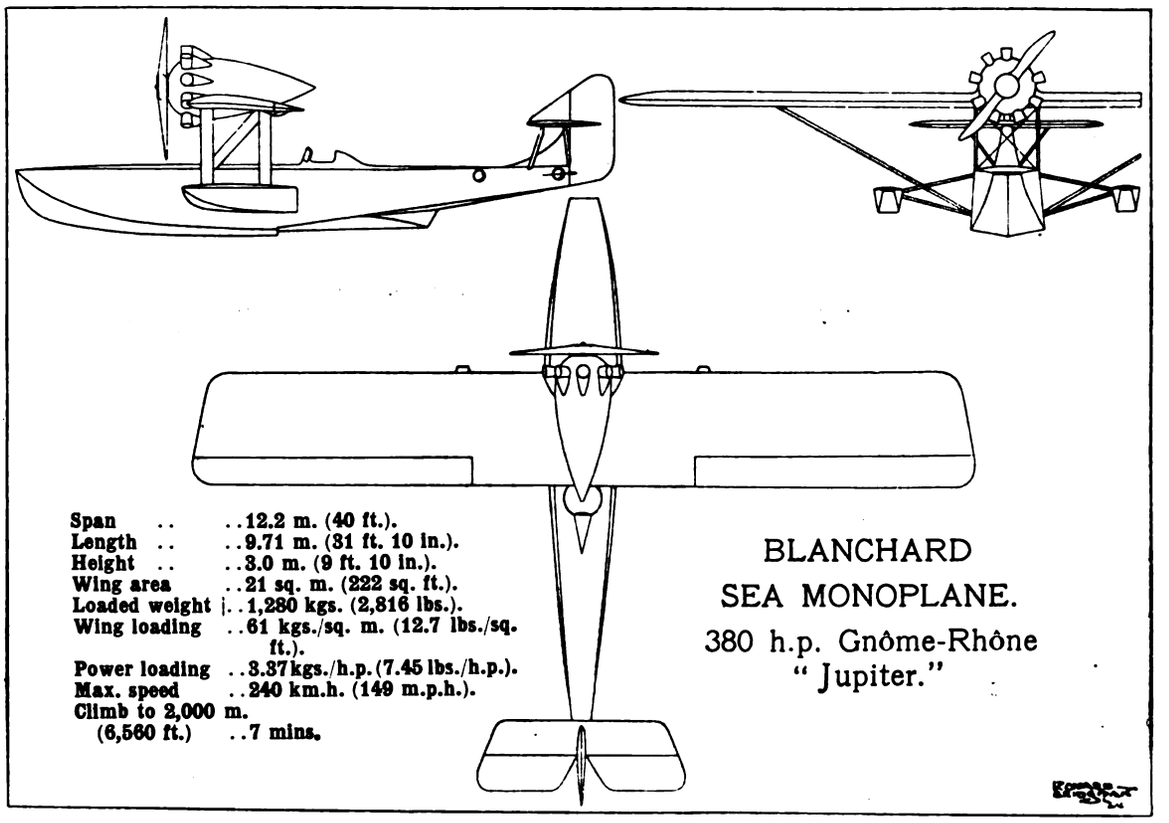
BLANCHARD—*continued.*


Span .. ..12.2 m. (40 ft.).
Length .. ..9.71 m. (31 ft. 10 in.).
Height .. ..3.0 m. (9 ft. 10 in.).
Wing area ..21 sq. m. (222 sq. ft.).
Loaded weight ..1,280 kgs. (2,816 lbs.).
Wing loading ..61 kgs./sq. m. (12.7 lbs./sq. ft.).
Power loading ..3.37 kgs./h.p. (7.45 lbs./h.p.).
Max. speed ..240 km.h. (149 m.p.h.).
Climb to 2,000 m. (6,560 ft.) ..7 mins.
BLANCHARD
SEA MONOPLANE.
380 h.p. Gnôme-Rhône
" Jupiter."

BLÉRIOT.

" Blériot-Aeronautique," Quai General Gallieni, Suresnes (Seine). Flying ground: Buc.

L. Blériot began to experiment in 1906, along Langley lines. By 1909 he was one of the leading French firms; and the first cross Channel flight was made by him on July 9th, 1909.

At the beginning of war the *Blériot* " Parasols," which afford the pilot a perfectly clear view below him, did much valuable reconnaissance work. The " tandem " type also did much good work. Later, these machines were found to be too slow for modern requirements, and the Blériot works at Buc and in Paris were turned on to produce various other types of machines required by the French Government.

Latterly the firm took over the S.P.A.D. interests, and most of their recent products are known by this name.

THE SPAD S.33.

This type of machine has been used regularly on the London-Paris service during 1921, and is one of the most successful of French commercial types.

It is fitted with a 250 h.p. Salmson Z.9 engine. It is built with a monocoque fuselage which gives internal cabin space for four passengers, with room for a fifth alongside the pilot.

The whole machine is extremely clean in outline, and performs remarkably well, considering the relatively low power employed.

A machine known as the S.48, is the same as the S.33, except that it has a Lorraine Dietrich engine of 280 h.p.

Specification of the Spad S.33.

Purpose	**Passenger Transport.**
Span	**11.6 m.**
Length overall	**9.08 m.**
Height overall	**3.3 m.**
Total surface	**43 sq. m.**
Engine	**250 h.p. Salmson.**
Weight empty	**1,000 kgs.**
Weight loaded	**2,000 kgs.**
Weight per h.p.	**8 kgs.**
Wing loading	**46.5 kgs. per sq. m.**
No. of passengers (pilot included)	**6.**
Tank capacity	**5 hours.**
Performance.	
Speed at 2,000 m.	180 km.p.h.
Climb.	
To 2,000 m.	23 mins.
Ceiling	4,000 m.

Side view of a Spad type S.33.

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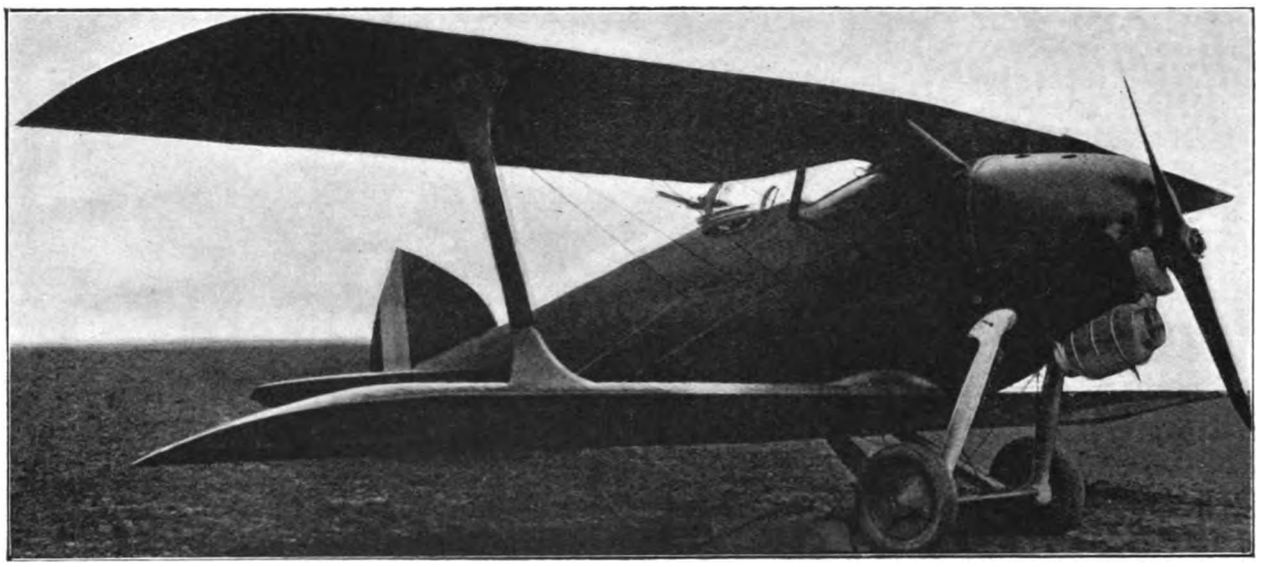
BLÉRIOT—*continued.*



The Spad 36 C.A.P.2 two-seat fighter (supercharged Hispano-Suiza 300 h.p.).

THE SPAD 36. C.A.P.2.

A two-seat fighter for high altitude work, equipped with the 300 h.p. Hispano-Suiza engine and a Rateau supercharger.

The general design follows the standard Herbemont outlines. The only important novelty is that wings, undercarriage and wing struts are of all duralumin construction.

The wing spars are of rectangular section tube, with circular tube drag struts.

The ribs are built up from duralumin tubes as top and bottom members, cross-braced with "Zeppelin type" corrugated strips.

Fuselage and tail unit are timber built.

The specification is given on the scale drawing reproduced.

Specification.

Span	**12.47 m. (40 ft. 9 in.).**
Length	**9.07 m. (29 ft. 9 in.).**
Height	**3.25 m. (10 ft. 8 in.).**
Wing area	**43 sq. m. (452 sq. ft.).**
Weight empty	**1,272 kgs. (2,800 lbs.).**
Weight of fuel	**310 kgs. (672 lbs.).**
War load	**400 kgs. (880 lbs.).**
Total weight	**1,982 kgs. (4,352 lbs.).**
Wing loading	**46 kgs./sq. m. (9.8 lbs./sq. ft.).**
Power loading	**5.2 kgs./h.p. (11.6 lbs./h.p.).**
Speed (sea level)	**215 km.h. (133 m.p.h.).**
Ceiling	**6,800 m. (22,300 ft.).**

THE SPAD 40A.2.

A two-seater reconnaissance machine equipped for photographic work and for general observational purposes. It is equipped with W/T., electric heating for the crew, and is arranged to carry a long focus camera within the fuselage.

It is armed with forward machine gun, firing through the airscrew, and with a ring mounting in the rear seat, together with a gun firing through the floor of the observer's seat.

It is of the same mixed duralumin and timber construction as the type 36 already described.

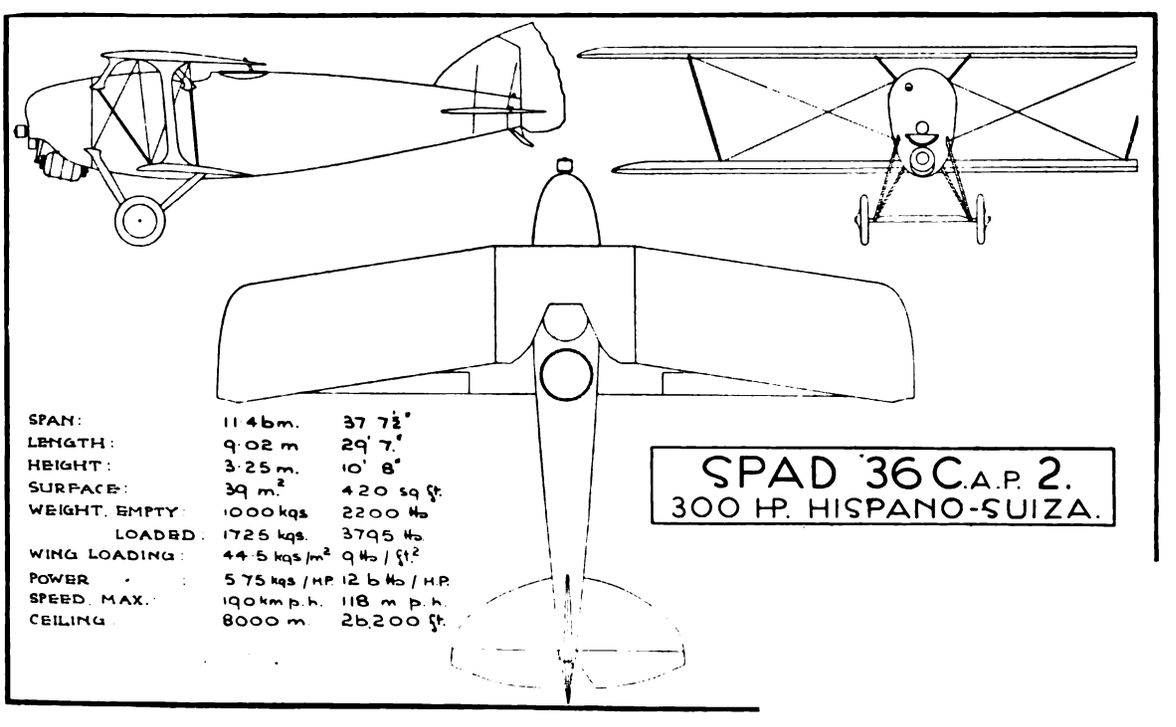
THE SPAD 41.C1.

A single-seat fighter, with the 300 h.p. Hispano-Suiza engine. The machine has been designed with a special view to the maximum of manœuvrability. It is equipped with electric heating for the pilot and with oxygen apparatus for high altitude work.

It carries the usual twin synchronised machine guns and also a camera.

It is of mixed duralumin and timber construction.

All available dimensions are given on the scale drawing reproduced on the next page.


SPAN: 11·4 b.m. 37 7½"
LENGTH: 9·02 m 29' 7"
HEIGHT: 3·25 m. 10' 8"
SURFACE: 39 m.² 420 sq ft.
WEIGHT. EMPTY: 1000 kgs 2200 lb
LOADED: 1725 kgs. 3795 lb
WING LOADING: 44·5 kgs/m² 9 lb / ft.²
POWER: 5·75 kgs / H.P. 12·6 lb / H.P.
SPEED. MAX.: 190 km p.h. 118 m p.h.
CEILING: 8000 m. 26,200 ft.
SPAD 36 C.A.P. 2.
300 H.P. HISPANO-SUIZA.

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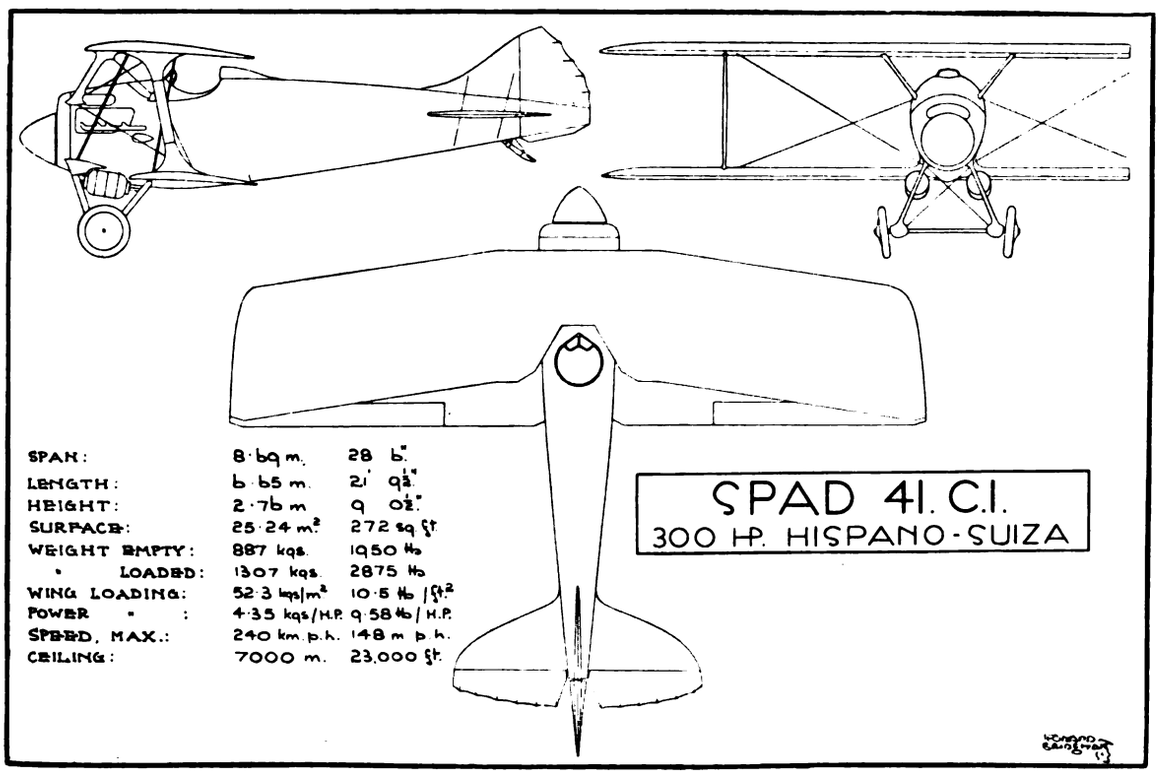
BLÉRIOT—*continued*


SPAN: 8·69 m. 28 ft. 6 in.
LENGTH: 6·65 m. 21' 9¼"
HEIGHT: 2·76 m 9' 0½"
SURFACE: 25·24 m² 272 sq. ft.
WEIGHT EMPTY: 887 kgs. 1950 lbs.
LOADED: 1307 kgs. 2875 lbs.
WING LOADING: 52·3 kgs/m² 10·5 lbs/sq. ft.
POWER : 4·35 kgs/H.P. 9·58 lbs/H.P.
SPEED, MAX.: 240 km.p.h. 148 m.p.h.
CEILING: 7000 m. 23,000 ft.
SPAD 41. C.I.
300 H.P. HISPANO-SUIZA

THE SPAD 42E2.

This is a two-seater dual control advanced training machine, fitted with the 180 h.p. Hispano-Suiza. In general outline the machine greatly resembles the Spad 34 elementary training machine described in the last issue.

It is entirely of timber construction.

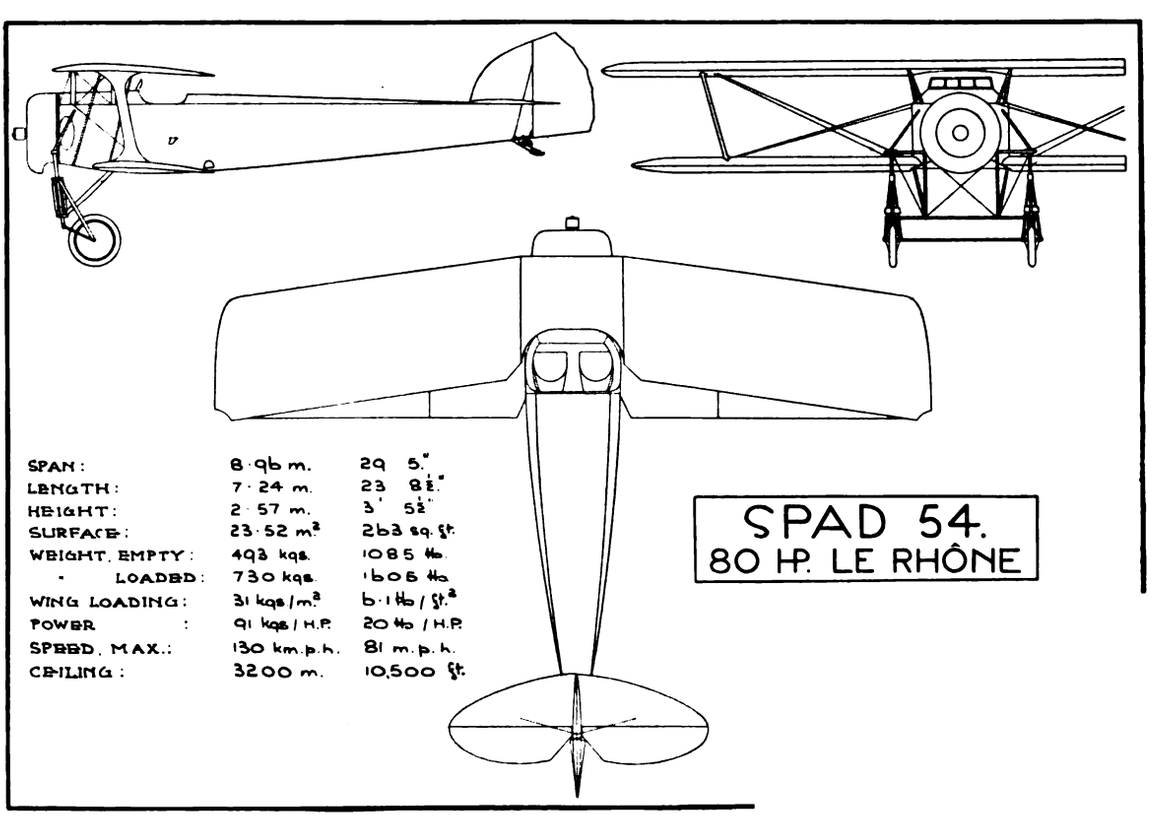
Specification.

Span	**8 m. 65. (28 ft. 4 in.).**
Length	**6 m. 77 (22 ft. 3 in.).**
Height	**2 m. 65 (8 ft. 8 in.).**
Wing area	**23.77 sq. m. (257 sq. ft.).**
Weight empty	**588 kgs. (1,296 lbs.).**
Weight loaded	**841 kgs. (1,850 lbs.).**
Wing loading	**36 kgs./sq. m. (7.2 lbs./sq. ft.).**
Power loading	**4.65 kgs. (10.25 lbs./h.p.).**
Speed, at sea level	**185 km.h. (115 m.p.h.).**
Ceiling	**5,000 m. (16,400 ft.).**

THE SPAD S.54.

A two-seater side-by-side dual control elementary training machine with the 80 h.p. Le Rhone engine. The machine is practically the same as the Type 34 training machine described in the last volume, but the newer machine has been fitted with the original castor wheel undercarriage of the pre-war Bleriot monoplanes.

All dimensions and weights are given on the scale drawing reproduced.


SPAN: 8·96 m. 29 ft. 5 in.
LENGTH: 7·24 m. 23 ft. 8½ in.
HEIGHT: 2·57 m. 8' 5½"
SURFACE: 23·52 m² 253 sq. ft.
WEIGHT, EMPTY: 493 kgs. 1085 lbs.
LOADED: 730 kgs. 1606 lbs.
WING LOADING: 31 kgs/m² 6·1 lbs/sq. ft.
POWER : 9·1 kgs/H.P. 20 lbs/H.P.
SPEED, MAX.: 130 km.p.h. 81 m.p.h.
CEILING: 3200 m. 10,500 ft.
SPAD 54.
80 H.P. LE RHÔNE

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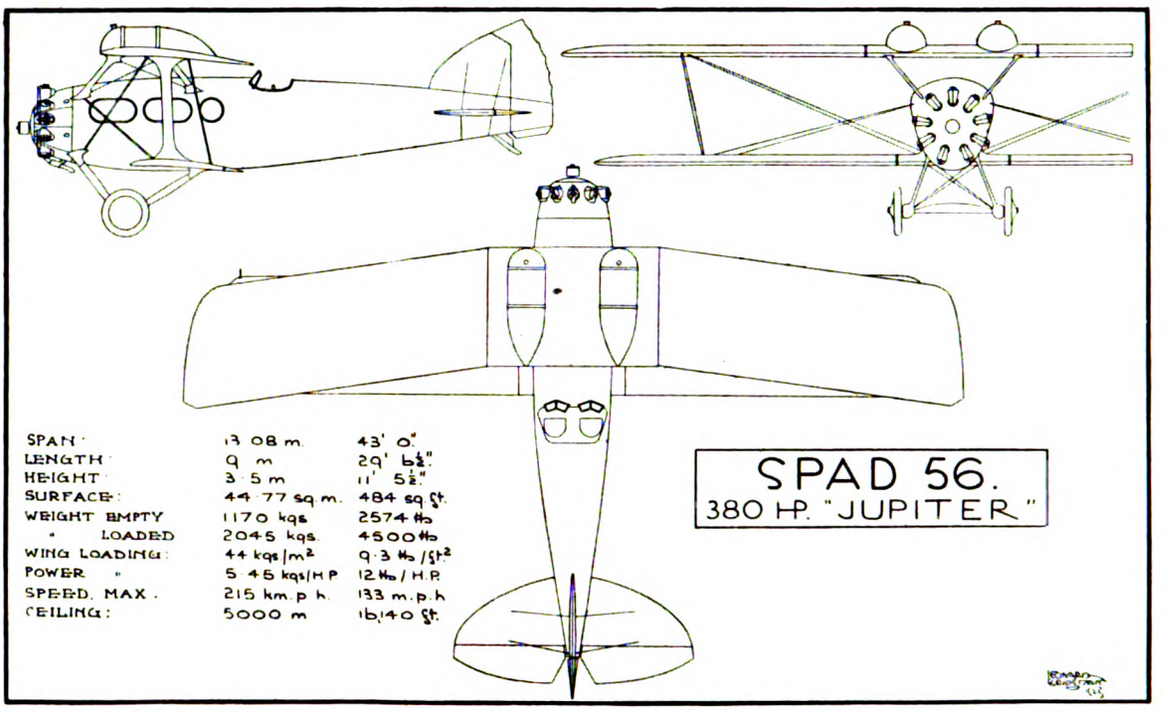
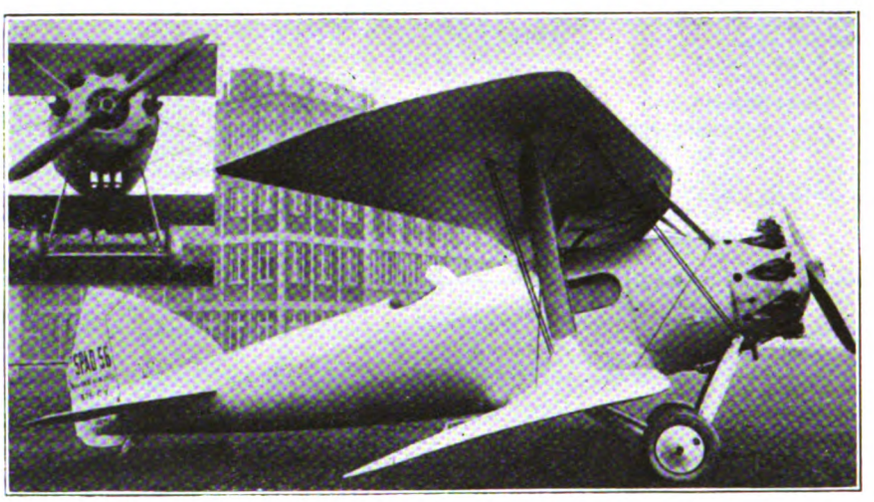
BLÉRIOT—*continued.*

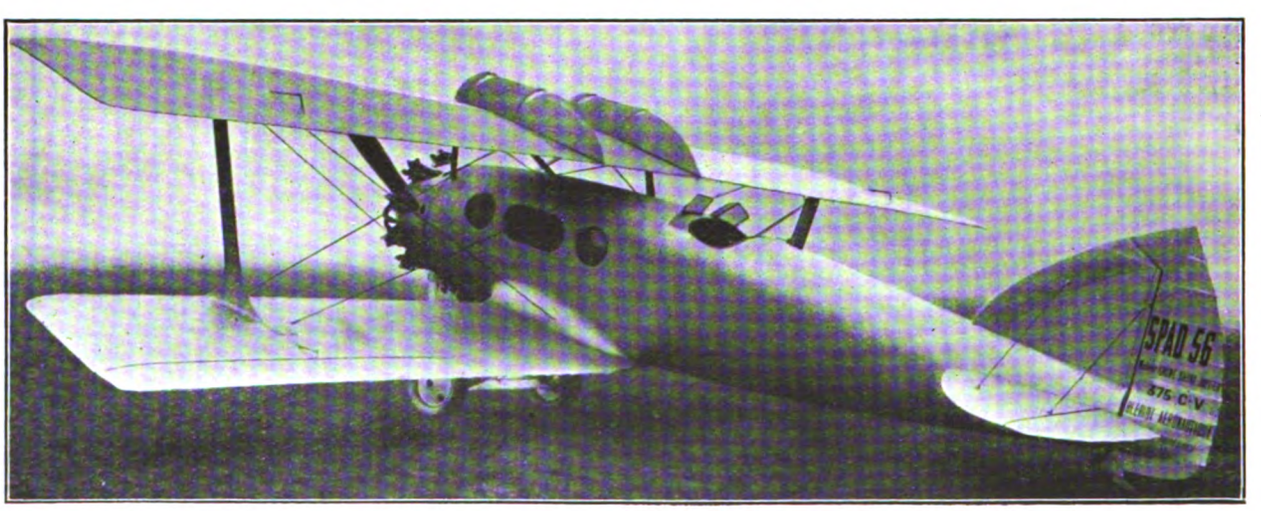

SPAD 56.
380 HP. "JUPITER"
SPAN: 13·08 m. 43' 0"
LENGTH: 9 m 29' 6½"
HEIGHT: 3·5 m 11' 5½"
SURFACE: 44·77 sq m. 484 sq ft.
WEIGHT EMPTY 1170 kgs 2574 lb
" LOADED 2045 kgs 4500 lb
WING LOADING: 44 kgs/m² 9·3 lb/ft²
POWER " 5·45 kgs/H.P 12 lb/H.P.
SPEED. MAX. 215 km.p.h. 133 m.p.h.
CEILING: 5000 m 16,140 ft.

THE SPAD 56.

A five-passenger commercial machine, fitted with the Gnome-Rhone companies' French-built "Jupiter" engine. In all essential characteristics the machine appears to be precisely like all other commercial Spads. The scale drawing and photograph give a good idea of the general arrangement.

This machine, early in 1923 put up a height record of 8,200 metres (26,896 ft.) carrying 250 kg. of useful load.





The Spad 56 (380 h.p. "Jupiter" engine).

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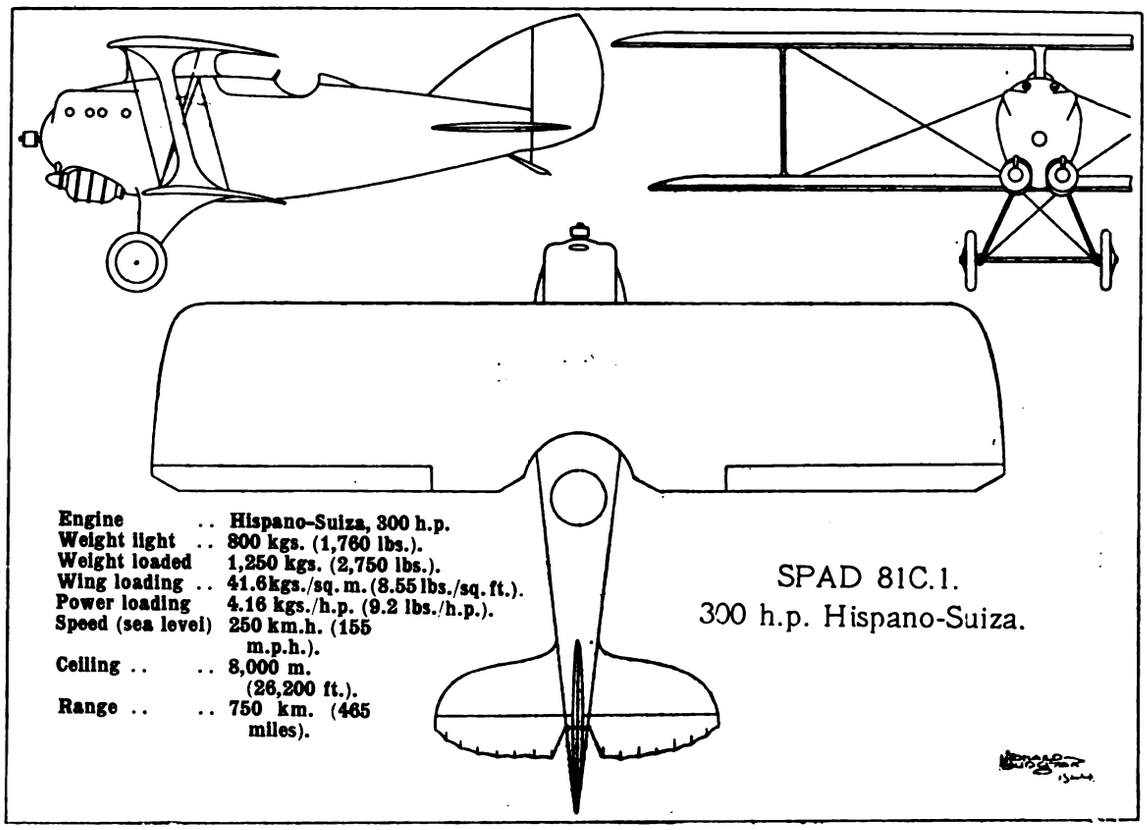
BLÉRIOT—*continued.*



Engine ..	Hispano-Suiza, 300 h.p.
Weight light ..	800 kgs. (1,760 lbs.).
Weight loaded	1,250 kgs. (2,750 lbs.).
Wing loading ..	41.6kgs./sq. m. (8.55 lbs./sq. ft.).
Power loading	4.16 kgs./h.p. (9.2 lbs./h.p.).
Speed (sea level)	250 km.h. (155 m.p.h.).
Ceiling	8,000 m. (26,200 ft.).
Range	750 km. (465 miles).

THE SPAD 61C.1.

A single-seat fighter of normal Spad type, with the 420 h.p. "Broad Arrow" type Lorraine-Dietrich engine. There is a slight modification of the usual wing arrangement—the upper wing is devoid of the usual sweep-back, so that there is a uniform stagger throughout.

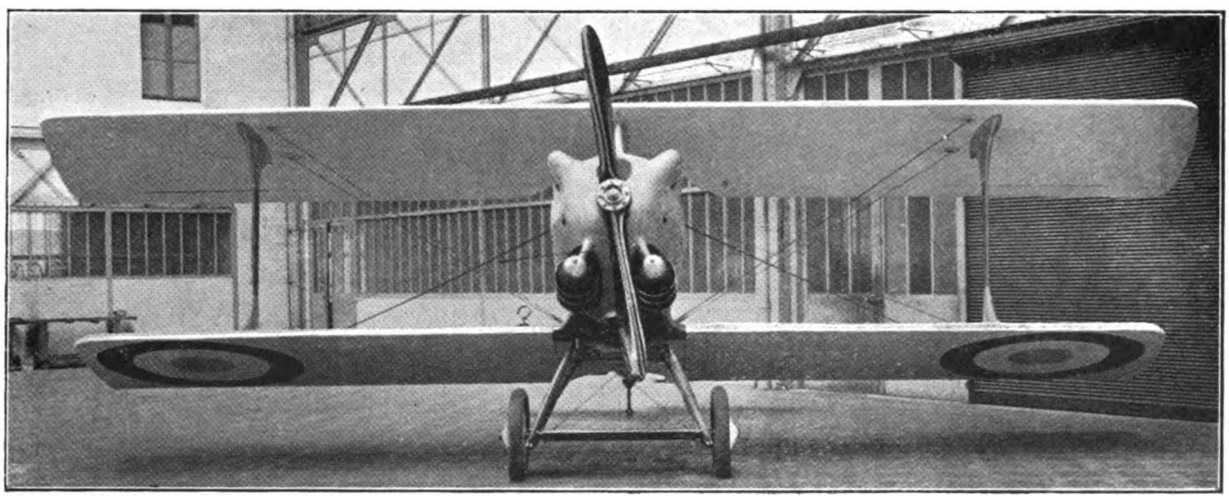
The top wing is supported above the fuselage by a faired-in cabane, not unlike that used on the original Gloucester Co's "Bamel." The wings are largely constructed of duralumin.

Specification.

Span (top)	9.62 m. (31 ft. 6 in.).
Span (bottom)	8.96 m. (29 ft. 5 in.).
Length	6.4 m. (21 ft.).
Height	2.8 m. (9 ft. 2 in.).
Chord (top)	2.0 m. (6 ft. 6½ in.).
Chord (bottom)	1.65 m. (5 ft. 5 in.).
Wing area	30 sq. m. (322 sq. ft.).
Engine	Lorraine-Dietrich, 425 h.p.
Weight light	1,012 kgs. (2,214 lbs.).
Weight loaded	1,522 kgs. (3,350 lbs.).
Wing loading	50.7 kgs./sq. m. (10.4 lbs./sq. ft.).
Power loading	3.5 kgs./h.p. (7.8 lbs./h.p.)
Speed (sea level)	260 km.h. (161 m.p.h.).
Ceiling	8,500 m. (29,000 ft.).
Range	800 km. (500 miles).

THE SPAD 81C.1.

This is the same machine as the 61C.1 in general arrangement and dimensions, fitted with the 300 h.p. Hispano-Suiza engine instead of with the Lorraine-Dietrich 428 h.p. engine. All dimensions are as the type 61 are on the scale drawing.



The Spad 81C.I. Fighter (300 h.p. Hispano-Suiza).

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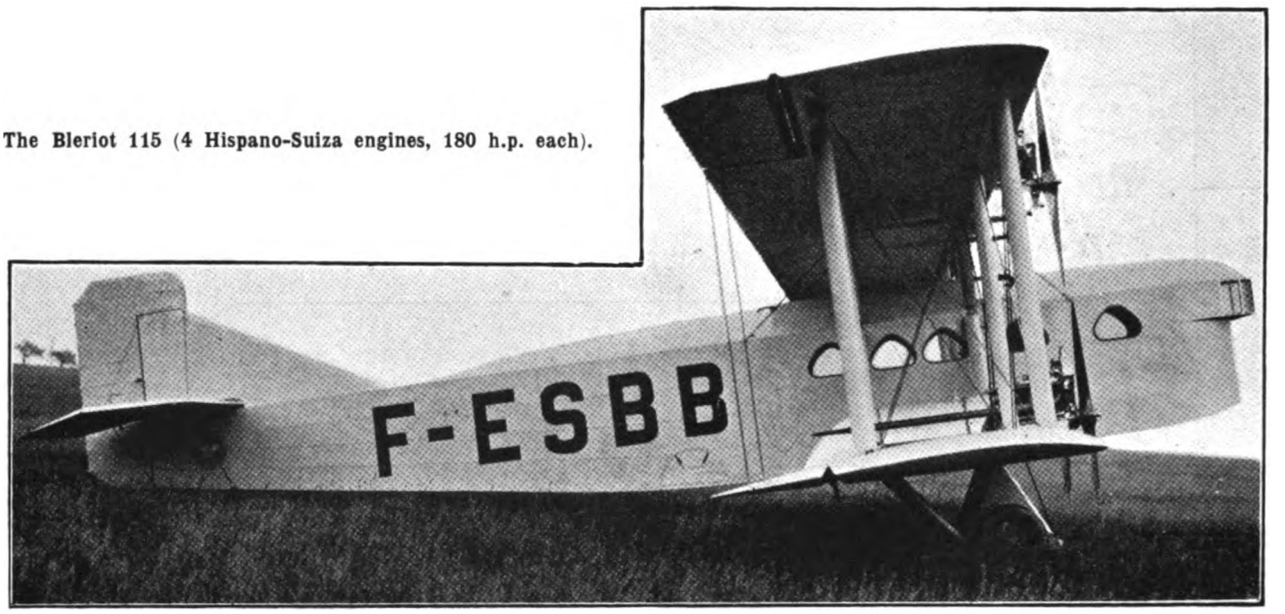
BLÉRIOT*—*continued.

The Bleriot 115 (4 Hispano-Suiza engines, 180 h.p. each).



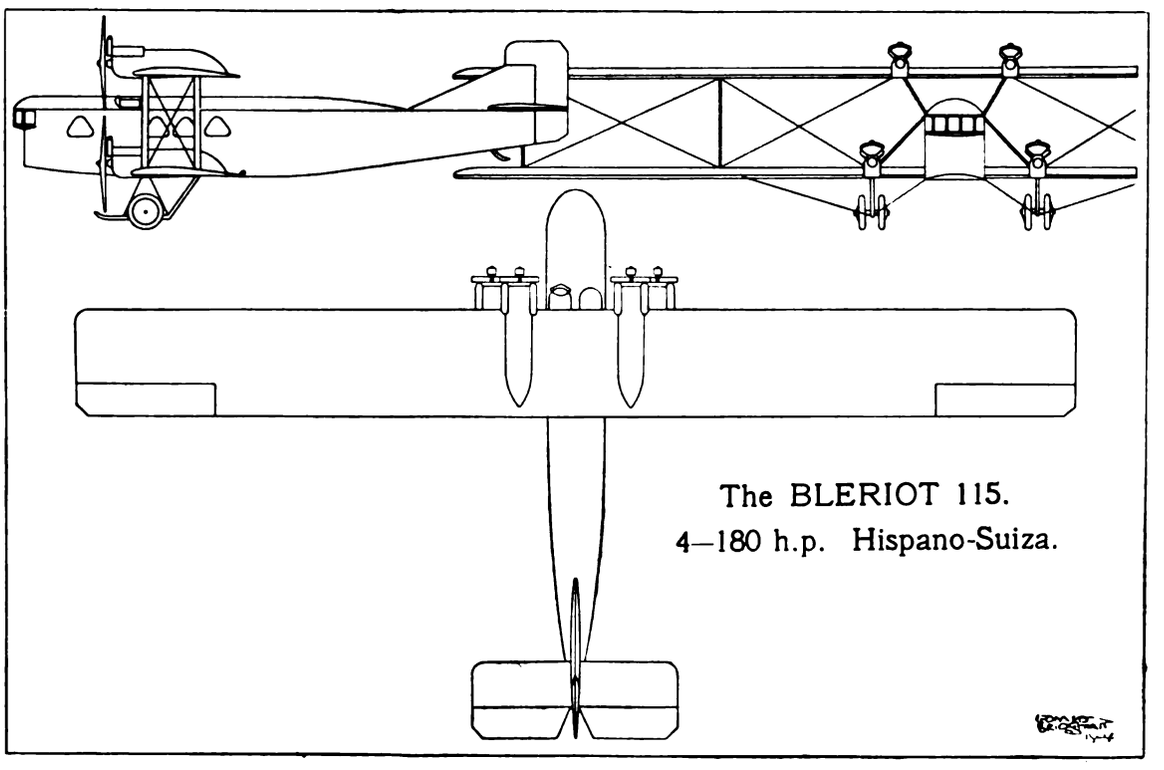
THE BLERIOT 115.

A four-engined passenger-carrier intended for a crew of three and eight passengers. The machine is a fuselage biplane carrying four 180 h.p. Hispano-Suiza engines, two on the top and two on the bottom wing—each driving a tractor airscrew. The four engine units are all interchangeable and the engines are uncowled, and the machine has petrol tanks which can be rapidly emptied in case of fire. Each engine is fitted with a self-starter, which can be operated from the pilot's seat, either in the air or on the ground. It is claimed that with full load the machine not merely flies, but can even "take-off" with two engines out of action.

The front of the fuselage carries the navigator's cockpit, with pilot and mechanic behind. The cabin, which seats eight, all facing forward, is very roomy and allows passengers to stand upright if they wish to.

Specification.

Span	**25.0 m. (82 ft.).**
Length	**14.45 m. (47 ft. 8 in.).**
Height	**2.60 m. (8 ft. 6½ in.).**
Wing area	**126 sq. m. (1,350 sq. ft.).**
Weight light	**2,900 kgs. (6,380 lbs.).**
Fuel and oil	**800 kgs. (1,760 lbs.).**
Loaded weight	**4,900 kgs. (10,780 lbs.).**
Engines	**4 Hispano-Suiza, 180 h.p. each.**
Wing loading	**39 kgs./sq. m. (8 lbs./ sq. ft.).**
Power loading	**6.8 kgs./h.p. (15.1 lbs./ h.p.).**
Speed (sea level)	**180 km.h. (110 m.p.h.).**



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BOREL. (S.C.I.M.)

Société Generale des Constructions Industrielles et Mechaniques (Anciens Etablissements Borel), 64, Quai National, Puteaux (Seine).

Formed in 1909 by M. Gabriel Borel, the firm were very early manufacturers of aircraft. Borel monoplanes with floats were used in the R.N.A.S. at the beginning of the War, and the firm appears to have built a few seaplanes for the French Service during the War.

Produced to the designs of M. Boccacio, a very high performance fighter just too late for the war.

THE BOREL Bo.C.A.P.2 TWO-SEATER ALL-METAL FIGHTER.

This is an all duralumin reconnaissance fighter two-seater. In general form it is a staggered biplane, lower wing of smaller chord but equal span to that of the top, with two bays of bracing on each side. The pilot sits under the rear spar and the observer is behind that.

The fuselage is of the normal wire braced type, duralumin tubes replacing the usual wooden longerons.

The wings are built on duralumin box spars, and the ribs are made with channel section flanges and sheet distance pieces—as close a translation of wooden construction into metal as one could reasonably expect to achieve.

All joints and wiring plates are of steel—precisely of the type used on normal timber-framed aircraft.

The engine is a Rateau Supercharged Hispano of 300 h.p., fitted with a built-in " Odier " starter.

Specification.

Span	**13 m. 0.**
Length	**8 m. 17.**
Height	**2 m. 88.**
Area	**39 m².**
Weight empty	**1,000 kgs.**
Weight loaded	**1,750 kgs.**
Wing loading	**45 kg. per m².**
Power loading	**5.9 kgs./h.p.**
Performance.	
Speed, sea level	200 km.h.
Speed, 4,000 m.	240 km.h.
Landing speed	102 km h.
Climb.	
Ceiling	10,000 m.

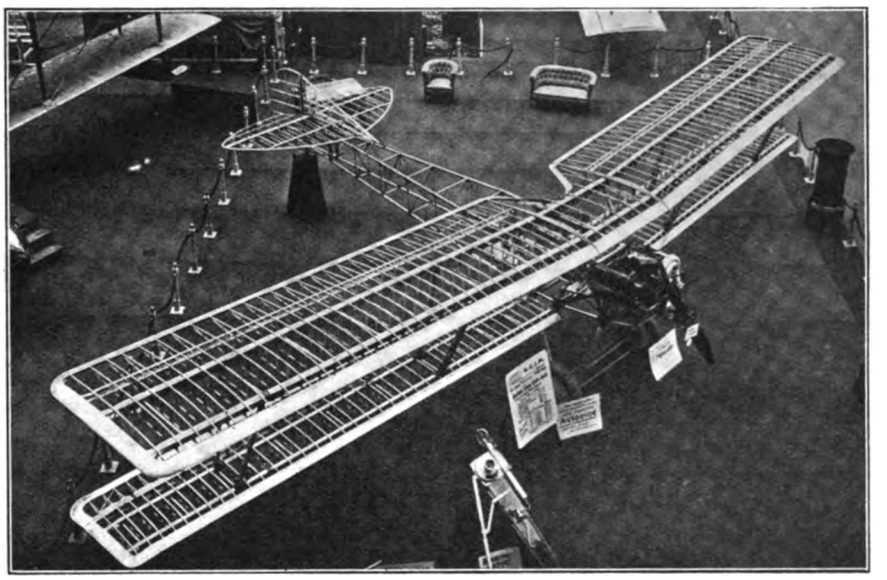
TWO-SEATER NIGHT FIGHTER.

A rigidly braced all-metal Sesquiplan with the 300 h.p. Hispano-Suiza. The duralumin construction is similar to that used in the machine described in opposite column.

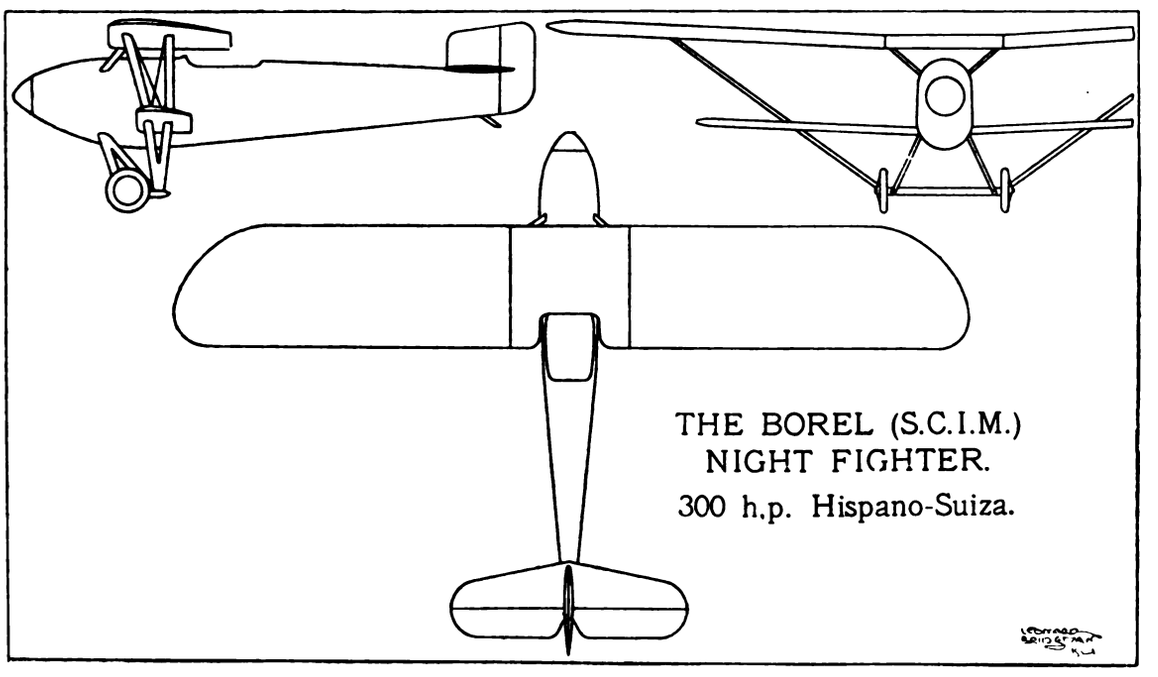
The lower wing is of considerably smaller span and chord than the upper one and the bracing is by tubular struts running from the undercarriage to the top wing, supporting the lower wing on the way. Dual control is fitted, and a built-in Letombe starter is employed.

Specification.

Span (top)	**13.7 m. (45 ft.).**
Span (bottom)	**8.6 m. (28 ft. 2 in.).**
Wing area	**34 sq. m. (365 sq. ft.).**
Weight empty	**900 kgs. (1,980 lbs.).**
Fuel and oil	**250 kgs. (550 lbs.).**
Weight loaded	**1,550 kgs. (3,410 lbs.).**
Engine	**300 h.p. Hispano-Suiza.**
Wing loading	**45.6 kgs./sq. m. (9.35 lbs./sq. ft.).**
Power loading	**5.2 kgs./h.p. (11.4 lbs./h.p.).**
Speed (sea level)	**225 km.h. (139 m.p.h.).**
Minimum speed	**86 km.h. (53 m.p.h.).**
Ceiling	**7,700 m. (25,200 ft.).**



The skeleton of the Borel Bo.C.A P.2 All-Duralumin two-seat fighter.



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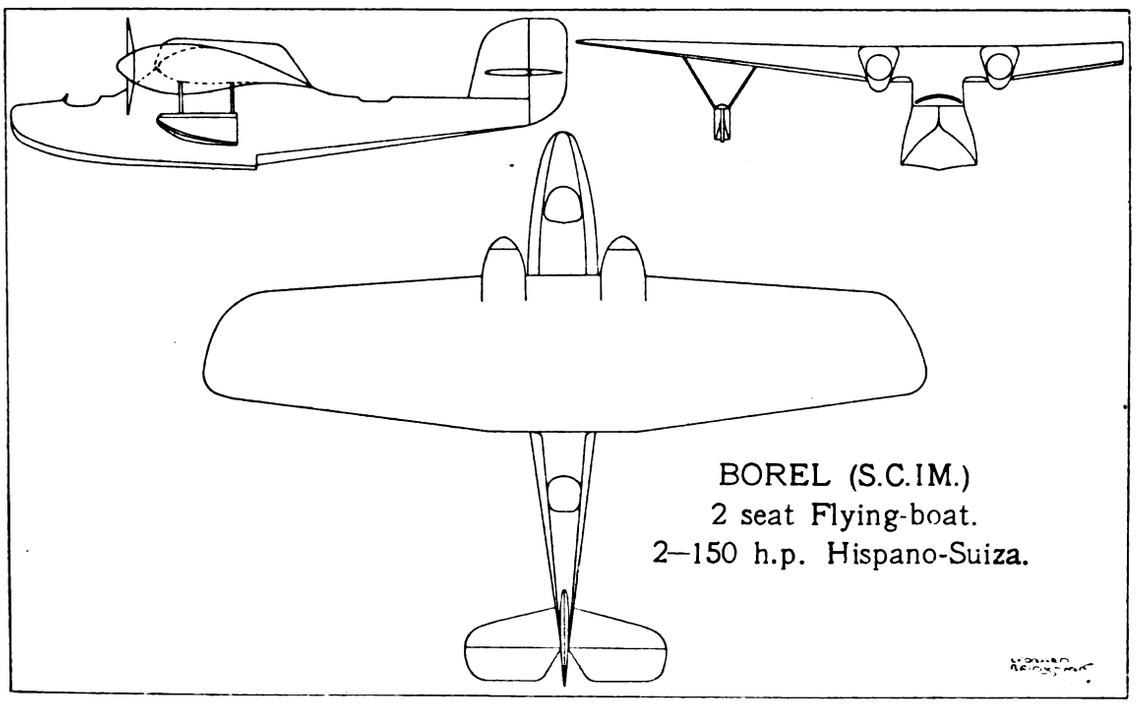
BOREL—*continued.*



TWO-SEATER FLYING-BOAT.

This is a twin-engine monoplane flying-boat intended for use from a seaplane-carrier. The wing is of very thick section and is built directly onto the top of the central hull, and two engine-mountings are built into the wing structure. A pair of side floats are carried on somewhat lengthy struts and little over half-way between engines and wing tips.

One seat is in the nose of the hull, the other is behind the wing, some 15 to 20 ft. behind the front seat. Communication by telephone is provided.

The wings fold outside of the engine-mounting—the machine being 10 m. (32 ft. 10 in.) wide when folded.

Specification.

Span	**15 m. (49 ft. 2 in.).**
Length	**11.5 m. (37 ft. 9 in.).**
Height	**3.45 m. (11 ft. 3 in.).**
Wing area	**38 sq. m. (408 sq. ft.).**
Weight light	**1,185 kgs. (2,601 lbs.).**
Fuel and oil	**250 kgs. (550 lbs.).**
Weight loaded	**1,885 kgs. (4,150 lbs.).**
Engines	**2 Hispano-Suiza, 150 h.p. each.**
Wing loading	**49.65 kgs./sq. m. (10.2 lbs./sq. ft.).**
Power loading	**6.3 kgs./h.p. (13.5 lbs./h.p.).**
Speed (sea level)	**196 km.h. (121 m.p.h.).**
Landing speed	**87 km.h. (53 m.p.h.).**
Ceiling	**6,000 m. (19,700 ft.).**

THREE-ENGINED PASSENGER-CARRIER.

A large cantilever wing of such thickness that its centre section forms a cabin wherein passengers and the like may be stowed. To the leading edge of the wing are attached three projections, each to carry one 400 h.p. Lorraine-Dietrich engine, the central one, in addition, carrying the pilot's cockpit. Behind the wing, a fuselage projects and carries a tail plane and elevators, together with a triple rudder and fin arrangement. Inside the wing is a central passage-way leading to the pilot's seat and the centre engine-mounting. On each side of this passage are carried fuel tanks—which can be dropped in an emergency—and four cabins for passengers. The two side engine-mountings may be reached in flight by further passages through the wings.

An undercarriage is fitted beneath each of the side engines. The design, it may be assumed, is still projectural.

Specification.

Span	**36 m. (118 ft.).**
Length	**22.4 m. (73 ft. 6 in.).**
Height	**5.94 m. (19 ft. 6 in.).**
Wing area	**228 sq. m. (2,450 sq. ft.).**
Weight loaded	**10,000 kgs. (22,000 lbs.).**
Wing loading	**43.8 kgs./sq. m. (9 lbs./sq. ft.).**
Power loading	**8.4 kgs./h.p. (18.3 lbs./h.p.).**
Estimated performance.	
Max. speed	200 km.h. (124 m.p.h.).
Landing speed	66 km.h. (41 m.p.h.).
Ceiling	6,500 m. (21,000 ft.).
Cruising range with 25 passengers	1,000 km. (620 miles).

BRÉGUET.

Société Anonyme des Ateliers d'Aviation Louis Bréguet, Rue de la Pompe 115, Paris. Works: Veligy-Vellacoublay (S. et O.).

Owned and directed by M. Louis Bréguet, one of the great pioneers of French aviation. M. Bréguet was one of the first designers to produce a satisfactory tractor biplane.

Has always specialised on metal construction. Made the best seaplane of 1913. Built in collaboration with the Bristol Co. in 1914. One of his machines won its class in the "Concours des Avions Puissants" in 1915.

THE BREGUET XIX.

This machine, which made its first public appearance at the Paris Show of 1921, has since been greatly improved. It is built in three types, a two-seater fighter, a two-seater reconnaissance machine, or as a bomber. It is entirely built of metal, except for some parts of the covering.

The wings are of what is known as the "Sesquiplan," or one and a half wing type, the upper one being of considerably greater chord and span than is the lower wing. The two wings are coupled by one sloping I strut on each side, and are braced by lift wires running from under the bottom wing, below the strut to the undercarriage, and by landing wires, which are in the usual position.

It may be presumed that this arrangement is intended to allow the passengers' gun a field of fire forward through the wings without risk of shooting away a flying wire

The fuselage is of standard Bréguet construction, duralumin tubes as longerons and struts with bracing wires in the panel. The outer form is circular in section, the covering being supported by light metal formers. The front of the fuselage is covered with extremely thin sheet duralumin, which is folded inwards on itself to form a bulbed fin at every 25 m/m. or so. This covering cannot be cheap, but is particularly stiff.

The radiator is of honeycomb type, below the fuselage, and can be raised to inside the fuselage.

The wing structure of the Breguet "Sesquiplan" is somewhat interesting. The spars are of the nature of box-girders with Zeppelin-type lattice work webs Ribs also are built up with webs of the same type. The workmanship is excellent, and the number of small parts to be manufactured and assembled is

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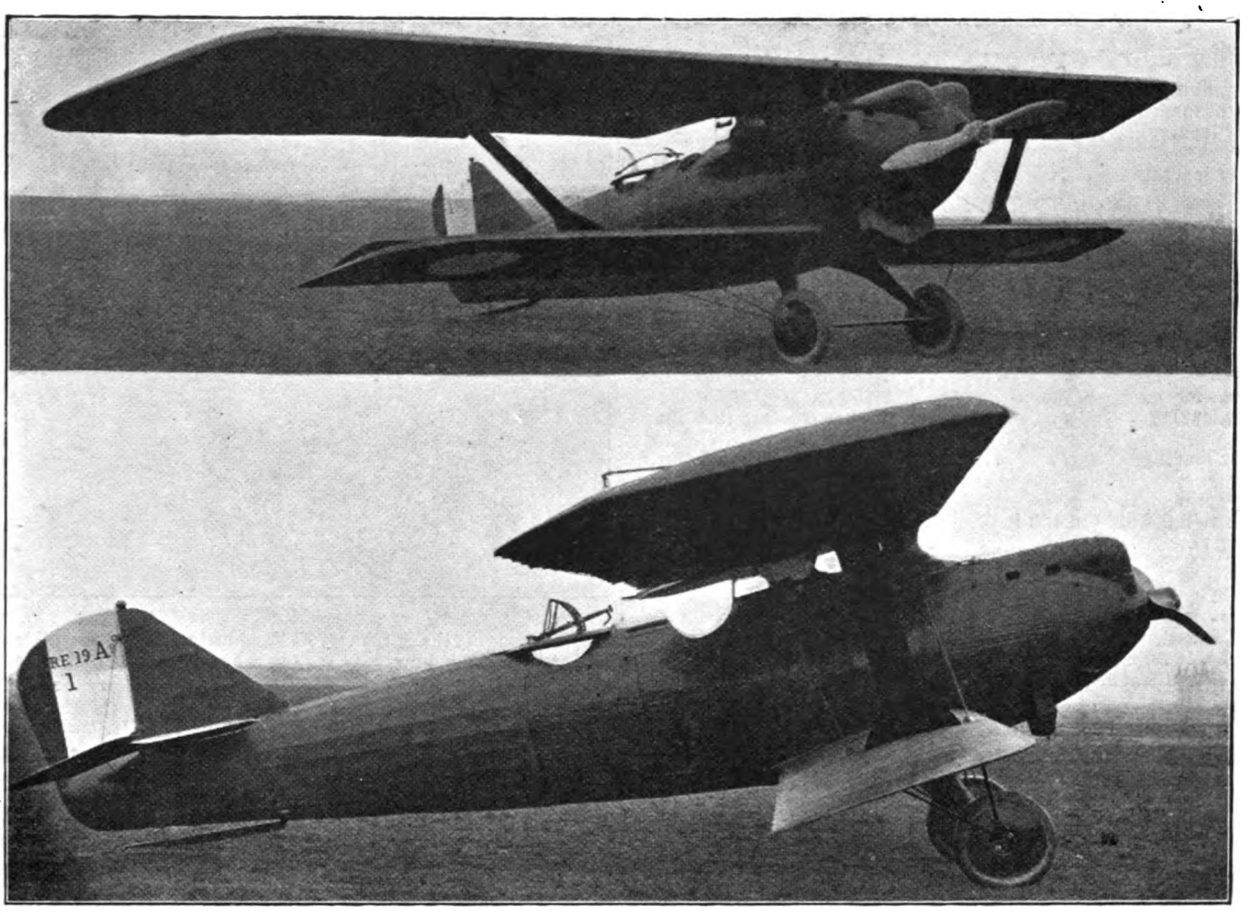
BREGUET—*continued.*



The Breguet XIX as a Two-seat Fighter (370 h.p. Lorraine-Dietrich).

colossal. Rivets must run into hundreds of thousands. The resulting structure is undoubtedly light.

The undercarriage consists of two deep struts tied by a horizontal axle. The wheels, which are Alpax castings, contain the rubber shock-absorbers.

Dimensions of this machine will be found on the scale drawing thereof.

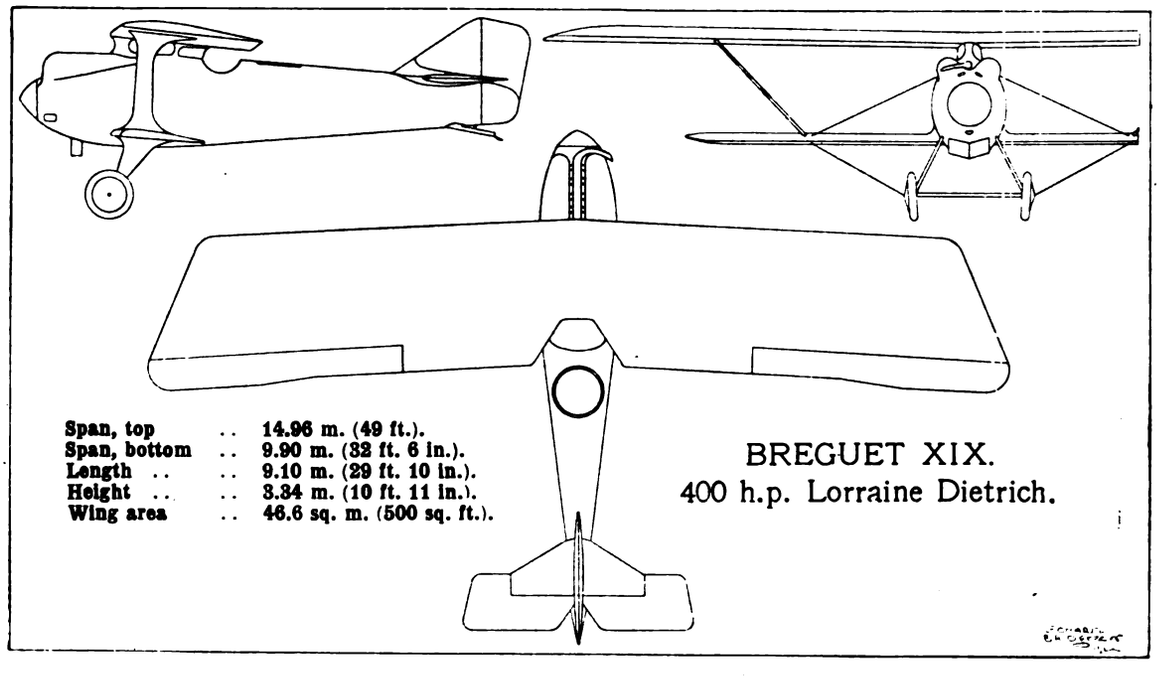
The type XIX is made as a two-seater fighter, as a corps reconnaissance machine and as a bomber, and details of loading and performance under the three conditions are given hereafter.

It was upon one of these machines, with the 370 h.p. Lorraine-Dietrich engine, that Lt. Peltier Doisy made a phenomenal flight from Paris to Hong Kong in the spring of 1924.

Specifications of the Breguet XIX.

As Two-seater Fighter.

Engine	**400 h.p. Lorraine-Dietrich.**
Weight empty	**1,200 kgs. (2,640 lbs.).**
Weight loaded	**1,750 kgs. (3,850 lbs.).**
Wing loading	**37 kgs./sq. m. (7.65 lbs./sq. ft.).**
Power loading	**4.4 kgs./h.p. (9.7 lbs./h.p.)**
Max. speed	**240 km.h. (149 m.p.h.).**
Climb to 5,000 m. (16,400 ft.) ..	**21 mins.**
Ceiling	**8,500 m. (27,800 ft.).**


Span, top .. 14.96 m. (49 ft.).
Span, bottom .. 9.90 m. (32 ft. 6 in.).
Length .. .. 9.10 m. (29 ft. 10 in.).
Height .. .. 3.34 m. (10 ft. 11 in.).
Wing area .. 46.6 sq. m. (500 sq. ft.).
BREGUET XIX.
400 h.p. Lorraine Dietrich.

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BREGUET—*continued.*

As Corp Reconnaissance Machine.

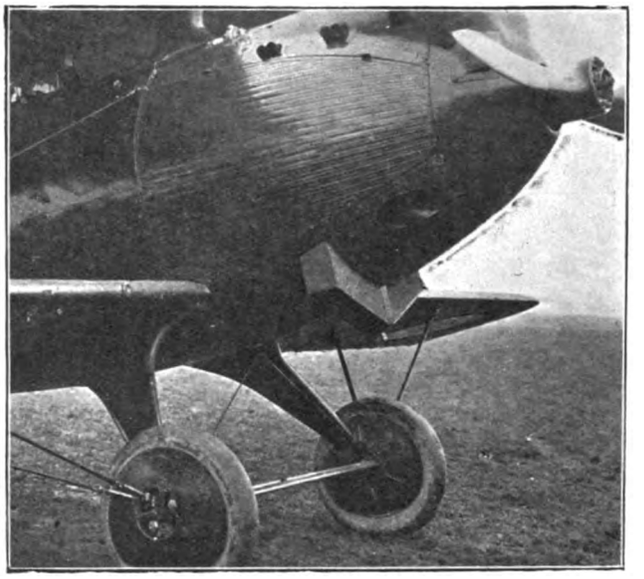
Engine	450 h.p. Lorraine-Dietrich.
Weight empty	1,200 kgs. (2,640 lbs.).
Weight loaded	1,885 kgs. (4,150 lbs.).
Wing loading	40 kgs./sq. m. (8.2 lbs./sq. ft.).
Power loading	4.2 kgs./h.p. (9.24 lbs./sq. ft.).
Max. speed	228 km.h. (141 m.p.h.).
Climb to 5,000 m. (16,400 ft.)	28 mins.
Ceiling	7,000 m. (23,000 ft.).

As Two-seat Bomber.

Engine	450 h.p. Renault or 450 h.p. Lorraine-Dietrich.
Weight empty	1,250 kgs. (2,750 lbs.).
Weight loaded	2,150 kgs. (4,730 lbs.).
Wing loading	45 kgs./sq. m. (9.4 lbs./sq. ft.).
Power loading	4.8 kgs./h.p. (10.5 lbs./h.p.).
Max. speed	228 km.h. (141 m.p.h.)
Climb to 5,000 m. (16,400 ft.)	26 mins.
Ceiling	6,800 m. (22,000 ft.).

THE BREGUET XIX T.

A six-passenger machine, derived from the military type XIX (Sesquiplan), by enlargement of the fuselage, forming a cabin completely filling the interplane gap, and fitting an undercarriage of increased track.



The nose of the Breguet XIX, showing the retractable radiator, the internally sprung wheels and the lift wire attachments.

THE BRÉGUET "LEVIATHAN."

This machine, destined for the reception of the 800 h.p. Breguet-Bugatti power plant, is a biplane of all-metal construction, wood entering into the construction only of the airscrew and a few minor fittings in the fuselage.

The fuselage is built on four duralumin tube longerons, braced by duralumin frames without cross wires. The seats for the pilots are well aft in the fuselage, and the space intervening between power plant and pilot forms a cabin available for either passengers or goods. Bombs are also considered as a possible load.

The wing cellule is built up with pressed duralumin ribs, duralumin box spars, and duralumin interplane struts of profiled section. Bracing of steel cable is used in the bays. All strut and cable fittings are of the ball and socket type, to avoid imposing on the structure moments caused by faulty erection. The upper wing has a dihedral, the lower wing is flat, and both wings are slightly swept back.

The power plant has, it is understood, not performed as it was expected to and the type appears to have been abandoned in favour of the twin-engined type XXII.

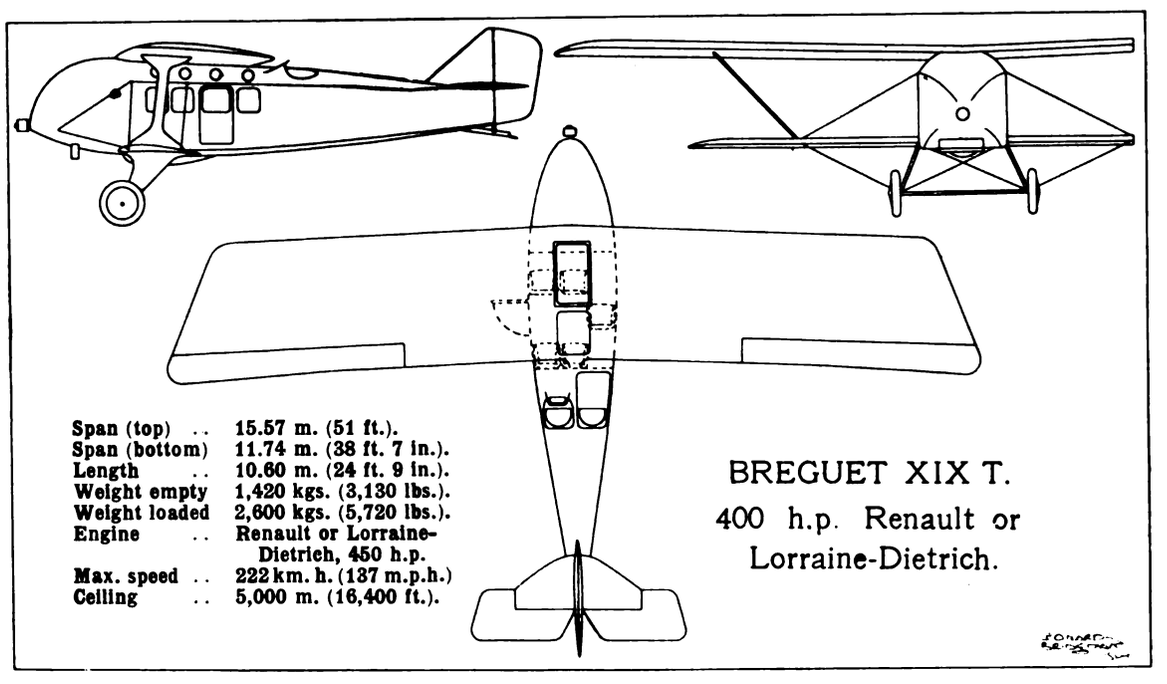
THE BREGUET "LEVIATHAN XXII."

A large twin-engine all-metal passenger-carrier, generally similar to the earlier "Leviathan" in structure, but with two 500 h.p. engine units in the wings instead of the central multiple power plant. The nose of the fuselage is occupied by a navigator, who is most fully provided with the necessary instruments. Behind and to the right, placed high up in the fuselage, is the pilot's cockpit.

The passenger cabin, which follows, is 7 m. long by 2 m. square (23 ft. by 6 ft. 7 in. square). It has a side entrance on the port side, aft the wings. This cabin is entirely covered in thin sheet duralumin of the form used on the fuselage of the Sesquiplan above. Ample windows, which can be opened, give light and ventilation.

The wings are built to form one central section carrying the power plants, with two extensions. Each wing is built on two tubular duralumin spars, with one intermediate braced girder of strip construction. The undercarriage is attached to the central wing unit.

The machine was meant to be fitted with two Breguet-Bugatti engines, each of 500 h.p., but four Lorraine-Dietrich 250 h.p.



Span (top)	15.57 m. (51 ft.).
Span (bottom)	11.74 m. (38 ft. 7 in.).
Length	10.60 m. (24 ft. 9 in.).
Weight empty	1,420 kgs. (3,130 lbs.).
Weight loaded	2,600 kgs. (5,720 lbs.).
Engine	Renault or Lorraine-Dietrich, 450 h.p.
Max. speed	222 km. h. (137 m.p.h.)
Ceiling	5,000 m. (16,400 ft.).

BREGUET XIX T.
400 h.p. Renault or
Lorraine-Dietrich.

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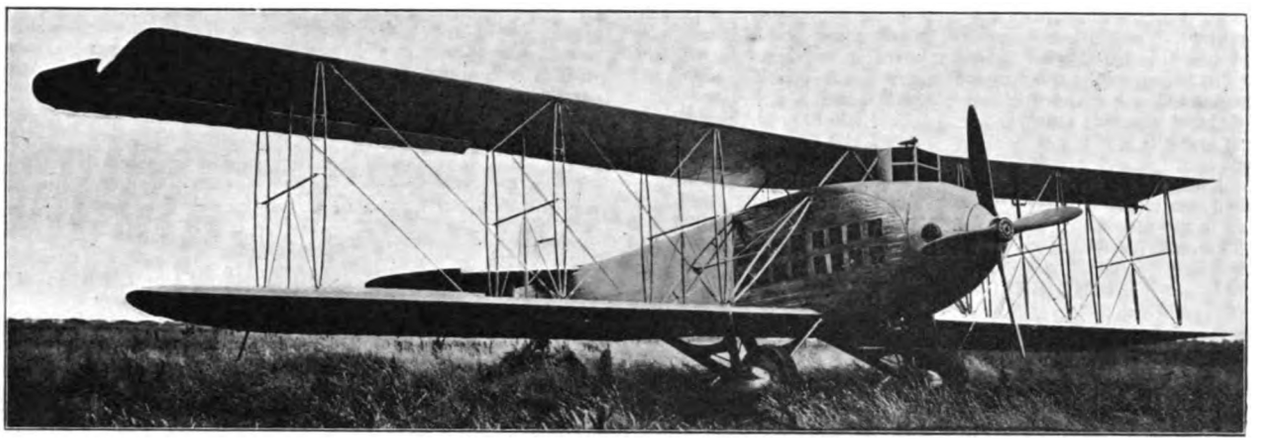
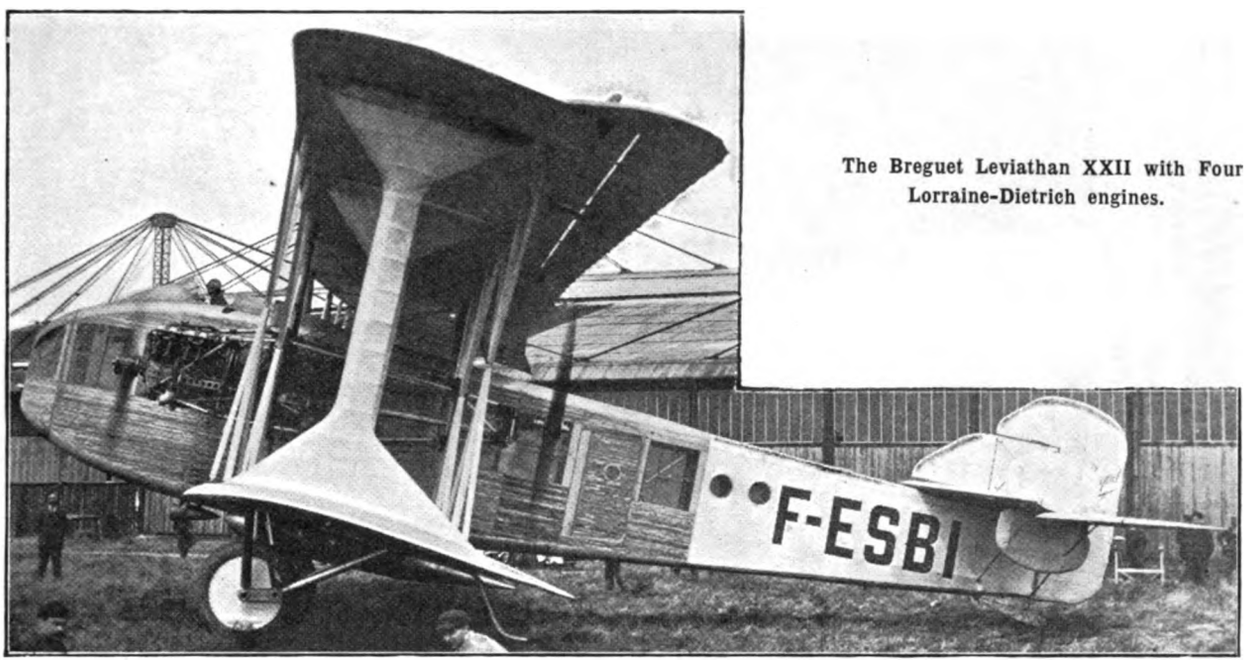
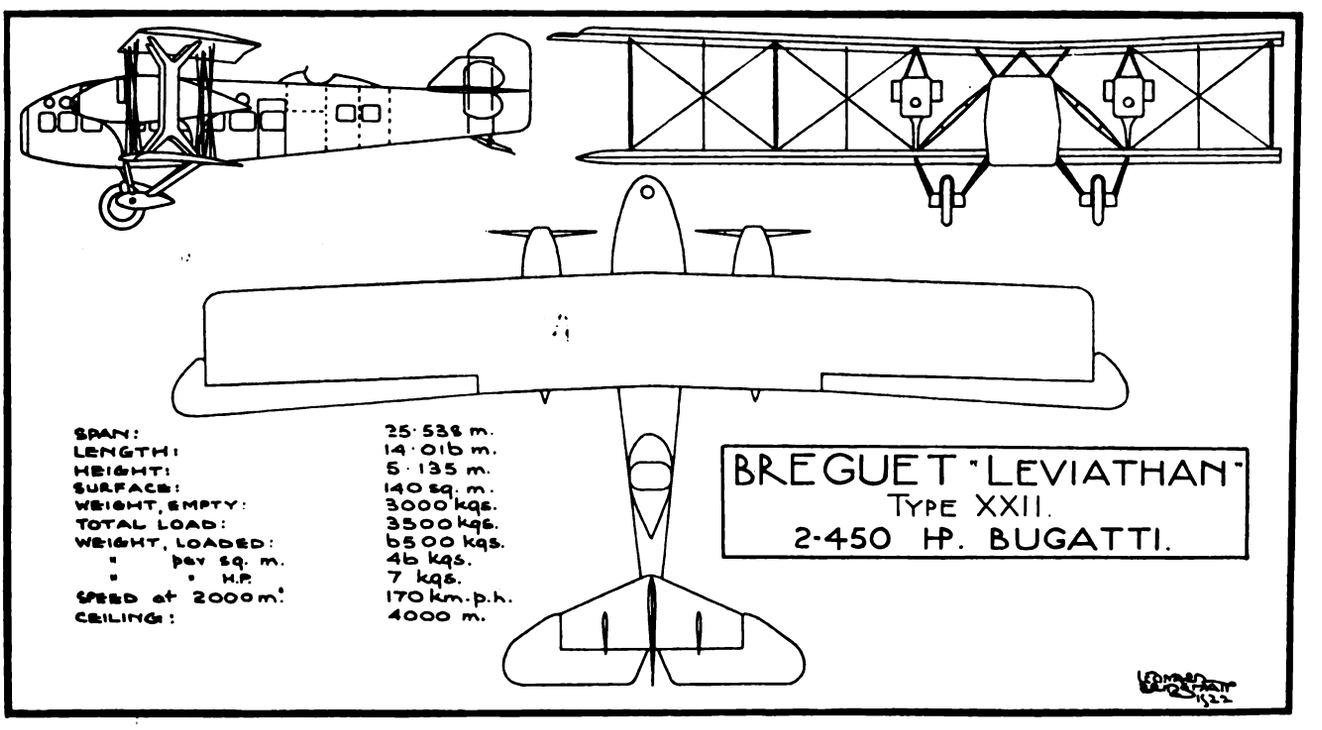
BREGUET—*continued.*



The Breguet type XX "Leviathan."



The Breguet Leviathan XXII with Four Lorraine-Dietrich engines.



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BREGUET—*continued.*

units have also been used. In this case, the engines are arranged in two tandem units, driving each one tractor and one pusher airscrew. The pusher screws in this case are geared down.

A machine fitted with the four Lorraine engines took part in the 1923 competition for the Grand Prix des Avions de Transport. The following are the performances then realized :—

Weight of machine empty	**4,300 kgs. (9,470 lbs.).**
Fuel and oil	**1,100 kgs. (2,420 lbs.).**
Load	**1,200 kgs. (2,650 lbs.).**
Total weight	**6,600 kgs. (14,300 lbs.).**
Speed (sea level)	**165 km.h. (103 m.p.h.).**
Run to get off	**Less than 250 m. (820 ft.).**

The machine flew level and made figures of 8 with one engine stopped.

THE BREGUET "COLIBRI."

A light aeroplane, built and entered for the competition organised by the Petit Parisien in 1923. The machine was a monoplane with rigid bracing to about one-third the way out on each half-span, driven by Sergant four-cylinder air-cooled engine of 16 h.p. The wings are of fairly thick section and were timber built. The fuselage was of rectangular section, with barrelled-out sides, built of duralumin tubes. The undercarriage consisted of an axle sprung to the bottom of the fuselage, carrying two wheels, which are partly recessed into the side of the body.

The pilot sits between the spars, and as the engine is extremely narrow and the top face of the fuselage proper slopes away rapidly ahead of the wing, he has an excellent view.

Specification.

Span	**10.4 m. (34 ft. 1¼ in.).**
Length	**6.1 m. (20 ft.).**
Wing area	**15 sq. m. (162 sq. ft.).**

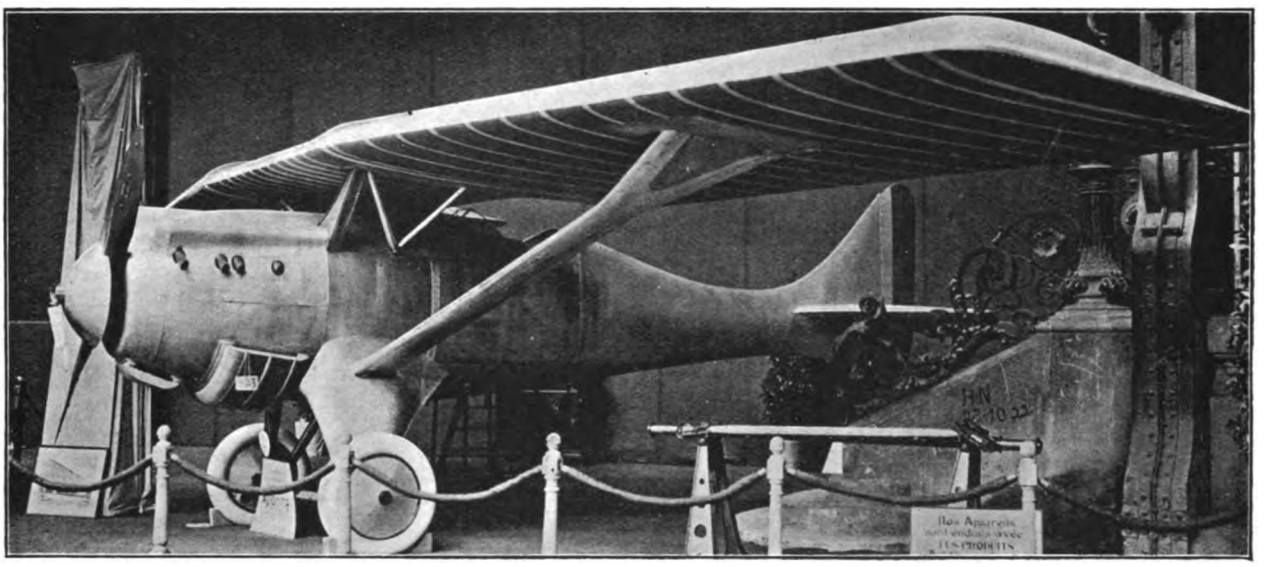
BUSCAYLET.

Buscaylet & Cie, 15, Rue Cler, Paris.

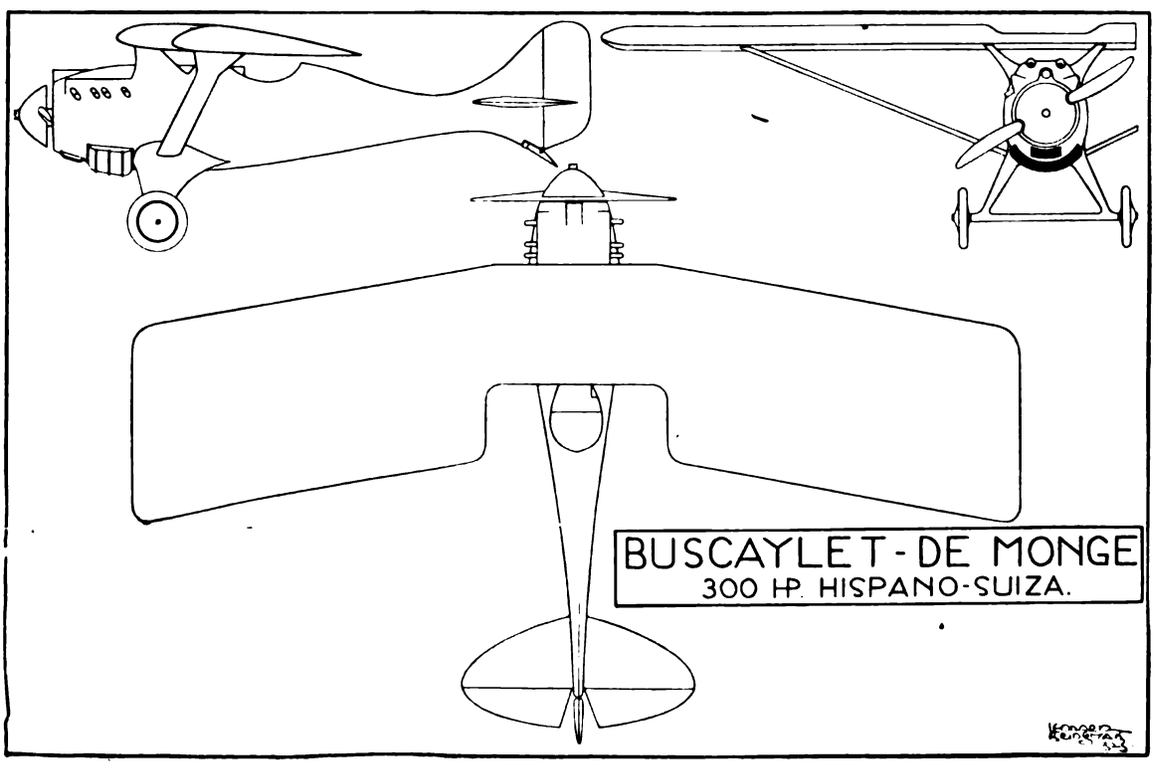
A firm believed to have built aircraft under contract during the War, which proposed in 1921 the curious-looking flying boat mentioned in last year's issue of this Annual.

It was suggested that the machine is capable of carrying fifteen passengers from Paris to New York in two and a half days.

The firm have recently secured the services of M. Louis de Monge as designer. and are now producing serious aircraft.



The Buscaylet-de Monge single-seater (300 h.p. Hispano-Suiza).



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BUSCAYLET—*continued.*

THE BUSCAYLET-DE MONGE FIGHTER.

This machine is a single-seater semi-cantilever monoplane. with the plane raised on a cabane which gives a clear view ahead. The pilot sits well aft and can see downwards in all directions.

The fuselage is of oval cross section and of somewhat unusual shape—being bulbous ahead and thinning down very markedly towards the tail. It is not only duralumin framed but duralumin covered.

. Wings and tail surfaces are covered with fabric, but otherwise the whole machine is of metal. Steel is employed in the wing bracing struts, the axle and for a few fittings, otherwise the material is duralumin. The workmanship is excellent throughout.

Specification.

Span	**10.9 m. (35 ft. 9 in.).**
Length	**7.15 m. (23 ft. 5 in.).**
Height	**2.7 m. (8 ft. 10 in.).**
Wing area	**24 sq. m. (258 sq. ft.).**
Weight loaded	**1,392 kgs. (3,062 lbs.).**
Engine	**Hispano-Suiza, 300 h.p.**
Wing loading	**58 kgs./sq. m. (11.7 lbs./sq. ft.).**
Power loading	**4.64 kgs./h.p. (10.2 lbs./h.p.).**
Max. speed	**270 km.h. (167 m.p.h.).**
Speed at 4,000 m. (13,120 ft.)	**250 km.h. (155 m.p.h.).**
Ceiling	**7,000 m. (23,000 ft.).**

THE 7.4 TOURING MACHINE.

This machine is a practical application of the use of the light aeroplane to experimental work, for it represents a one-third scale model of a proposed high-powered passenger carrier.

The machine consists of a very thick biconvex centre section which carries on its leading edge two 3-cylinder 35 h.p. Anzani engines with their axes slightly canted out of the line of flight, so that the airscrew tips overlap, the engine centres being less than one diameter of the airscrew apart. In this centre section are arranged two side-by-side seats, with a luggage space as well.

Behind and attached to the centre section, a pair of deep girder tail booms run aft to support the tail—which consists of fixed plane and elevators, together with twin rudders and fins.

Outside the centre section there are attached two extension wings, heavily tapered both in plan and in thickness. These are braced from the bottom of the centre-section by rigid struts. Ailerons of very narrow chord are fitted over the whole of the outer wing sections.

The machine has proved to be thoroughly controllable with either engine alone in action, flying quite strongly under these conditions.

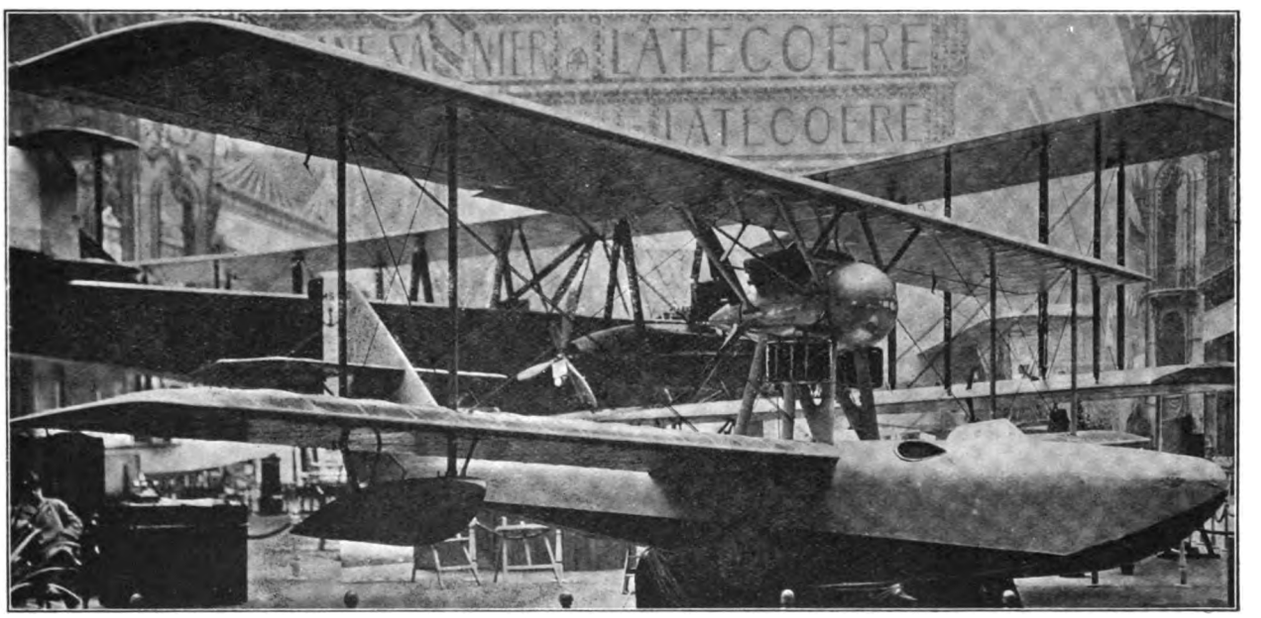
The machine is mainly built of spruce and three-ply, with duralumin fittings.

Specification.

Span	**10.7 m. (35 ft. 1 in.).**
Length	**5.32 m. (17 ft. 5 in.).**
Height	**1.05 m. (3 ft. 5 in.).**
Wing area	**23.3 sq. m. (250 sq. ft.).**
Weight empty	**400 kgs. (880 lbs.).**
Weight loaded	**650 kgs. (1,430 lbs.).**
Wing loading	**28 kgs./sq. m. (6.3 lbs./sq. ft.).**
Power loading	**9.2 kgs./h.p. (20.5 lbs./h.p.).**
Cruising speed	**145 km.h. (90 m.p.h.).**

C

C.A.M.S.



The C.A.M.S. Type 30E two-seater.

Chantiers Aero-Maritimes de la Seine, 72, Rue de la Boétie, Paris.

A new firm, established in France by Mr. D. Lawrence Santoni, Builds flying-boats to the designs of M. Conflenti, who has long been associated with Mr. Santoni.

THE C.A.M.S. 30E.

A two-seater general utility flying-boat.

Specification.

Span	**12.5 m. (41 ft.).**
Length	**9.2 m. (30 ft. 2 in.).**
Area	**43 sq. m. (452 sq. ft.).**
Weight loaded	**1,180 kgs. (2,596 lbs.).**
Engine	**Hispano-Suiza, 140 h.p.**
Wing loading	**27.5 kgs./sq. m. (5.75 lbs./sq. ft.).**
Power loading	**8.45 kgs./h.p. (18.4 lbs./h.p.).**
Speed	**145 km.h. (90 m.p.h.).**

THE C.A.M.S. 31B.

A two-seater boat of similar arrangement to the 30T fitted with a 300 h.p. Hispano-Suiza engine which can be used for light rapid transport or for military purposes. A photograph and general arrangement drawing will be found overleaf.

A single-seater (type 31) is also built.

THE C.A.M.S. 33.

A flying-boat with twin tandem 270 h.p. low compression Hispano-Suiza engines. It can be used as a bomb-carrier or may be equipped for passengers. A general arrangement and photographs will be found on the following pages.

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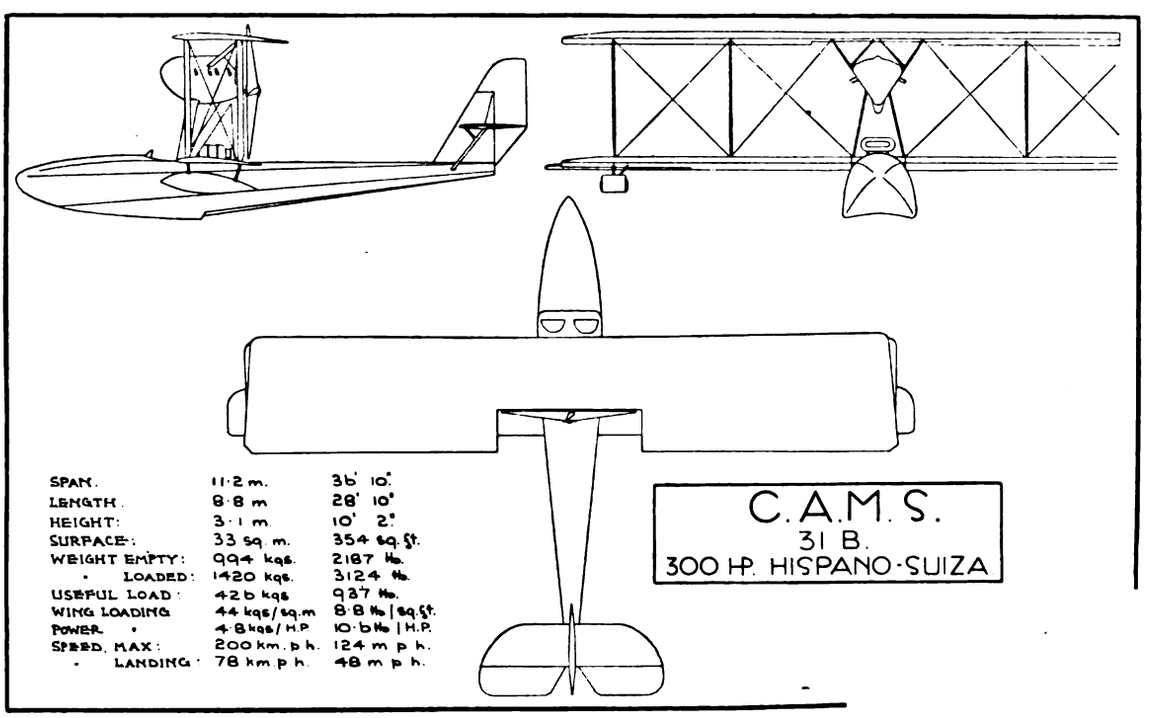
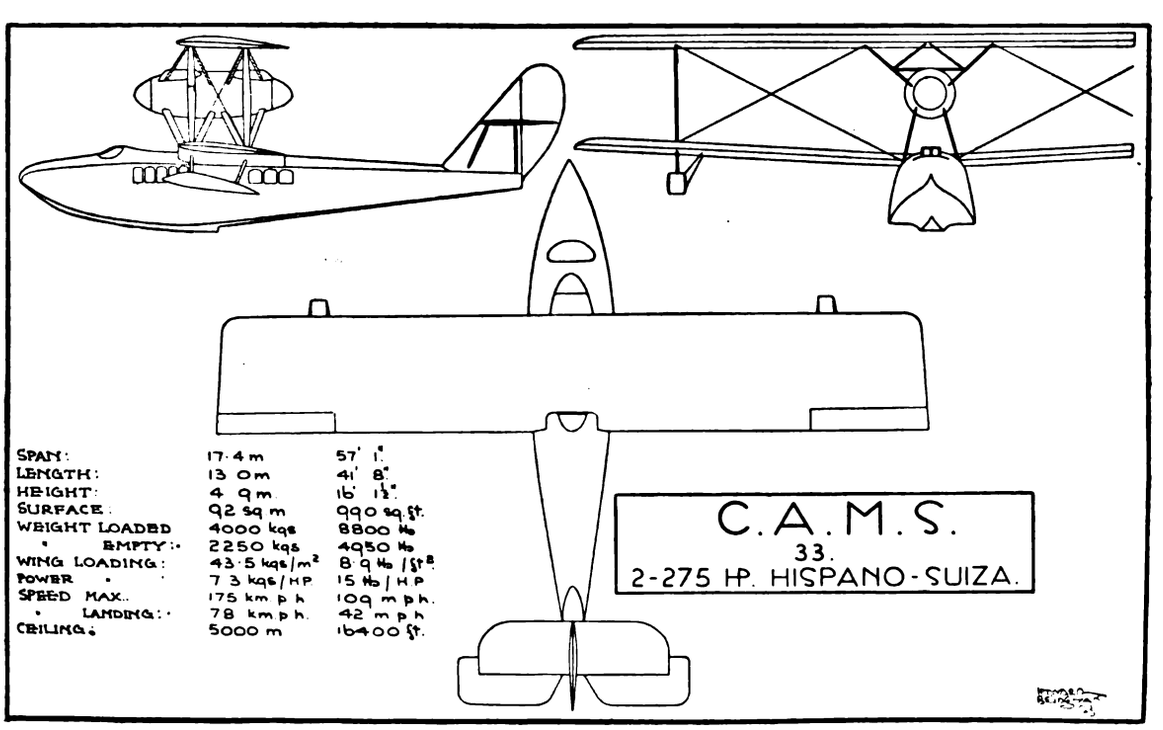
C.A.M.S.—*continued.*

The C.A.M.S Type 31 single-seater.



SPAN.	11·2 m.	36' 10"
LENGTH.	8·8 m	28' 10"
HEIGHT:	3·1 m.	10' 2"
SURFACE:	33 sq. m.	354 sq. ft.
WEIGHT EMPTY:	994 kgs.	2187 lbs.
" LOADED:	1420 kgs.	3124 lbs.
USEFUL LOAD:	426 kgs	937 lbs.
WING LOADING	44 kgs/sq.m	8·8 lbs / sq.ft.
POWER "	4·8 kgs / H.P	10·6 lbs / H.P.
SPEED. MAX:	200 km. p h.	124 m p h.
" LANDING:	78 km p h.	48 m p h.



SPAN:	17·4 m	57' 1"
LENGTH:	13 0m	41' 8"
HEIGHT:	4 9m	16' 1½"
SURFACE:	92 sq m	990 sq. ft.
WEIGHT LOADED	4000 kgs	8800 lbs
" EMPTY:	2250 kgs	4950 lbs
WING LOADING:	43·5 kgs/m²	8·9 lbs / ft²
POWER "	7 3 kgs / HP	15 lbs / H P
SPEED MAX.	175 km p h	109 m p h.
" LANDING:	78 km p h.	42 m p h
CEILING:	5000 m	16400 ft.

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C.A.M.S.—*continued.*

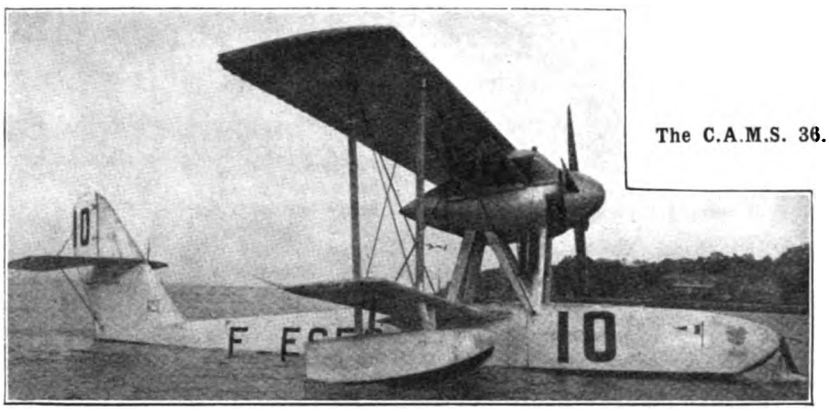
The C.A.M.S. 33.

THE C.A.M.S. 36.

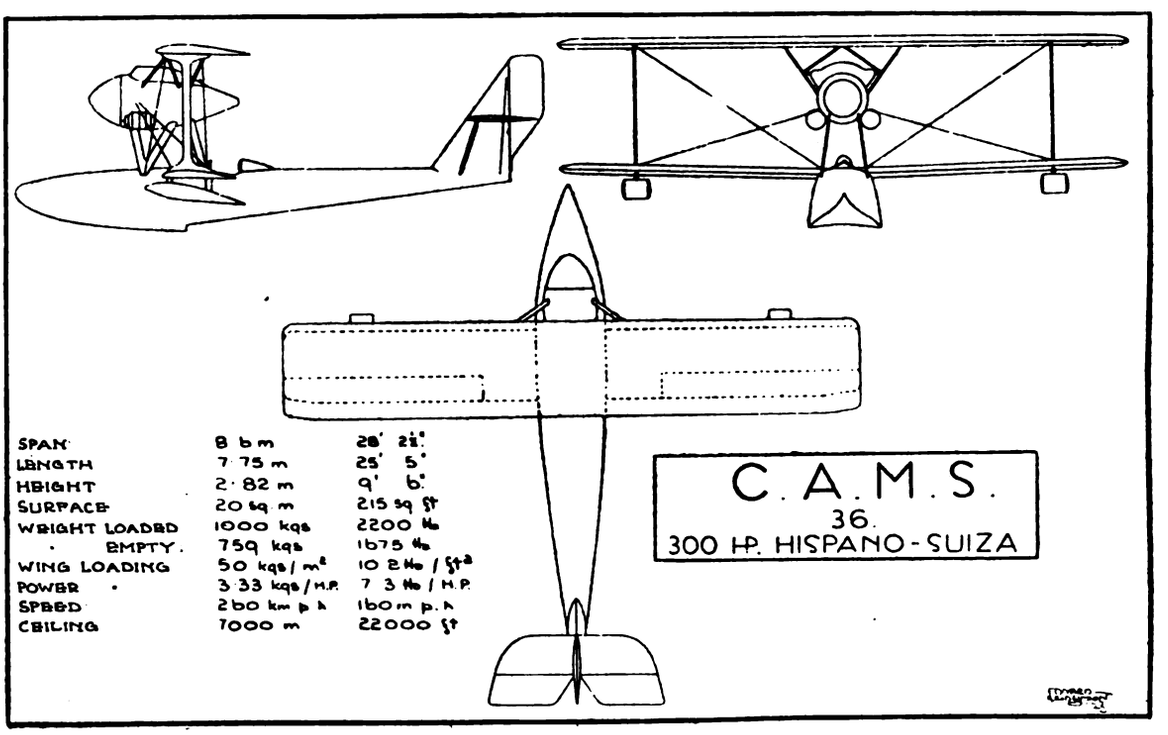
A high-speed single-seat flying-boat with 300 h.p. Hispano-Suiza engine driving a tractor airscrew. A machine of this type was entered for the 1923 Schneider Cup race and showed itself to be remarkably fast, considering the relatively low power employed. It is shown in photograph and in a general arrangement drawing.

THE C.A.M.S. 38.

A machine very similar to the type 36, but with pusher airscrew. It was also entered for the Schneider Cup race, but unfortunately fouled a buoy in its progress towards the starting line and put out of commission. It is said to be appreciably faster than the 36.



The C.A.M.S. 36.


C.A.M.S.
36.
300 HP. HISPANO-SUIZA
SPAN 8 b m 28' 2½"
LENGTH 7·75 m 25' 5"
HEIGHT 2·82 m 9' 6"
SURFACE 20 sq m 215 sq ft
WEIGHT LOADED 1000 kgs 2200 lbs
EMPTY. 759 kgs 1675 lbs
WING LOADING 50 kgs/m² 10·2 lbs/ft²
POWER 3·33 kgs/H.P. 7·3 lbs/H.P.
SPEED 260 km p h 160 m p h
CEILING 7000 m 22000 ft

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C.A.M.S.—*continued.*

A C.A.M.S. 38 Racer (300 h.p. Hispano).

The C.A.M.S. 31B Two-seater.

CAUDRON.

René Caudron, Issy-les-Moulineaux. (Seine).
School: Le Crotoy (Aerodrome de la Baie de la Somme).

The Caudron proved on active service to be one of the most useful French aeroplanes. It was largely used for artillery control and for bomb-dropping, because of its great weight-lifting capacity, and its imperviousness to bad weather. Other firms whose own designs have not been successful were turned on by the French Government to build Caudrons.

Since the advent of civil flying Caudrons have been considerably used in France.

THE CAUDRON C59 & C60.

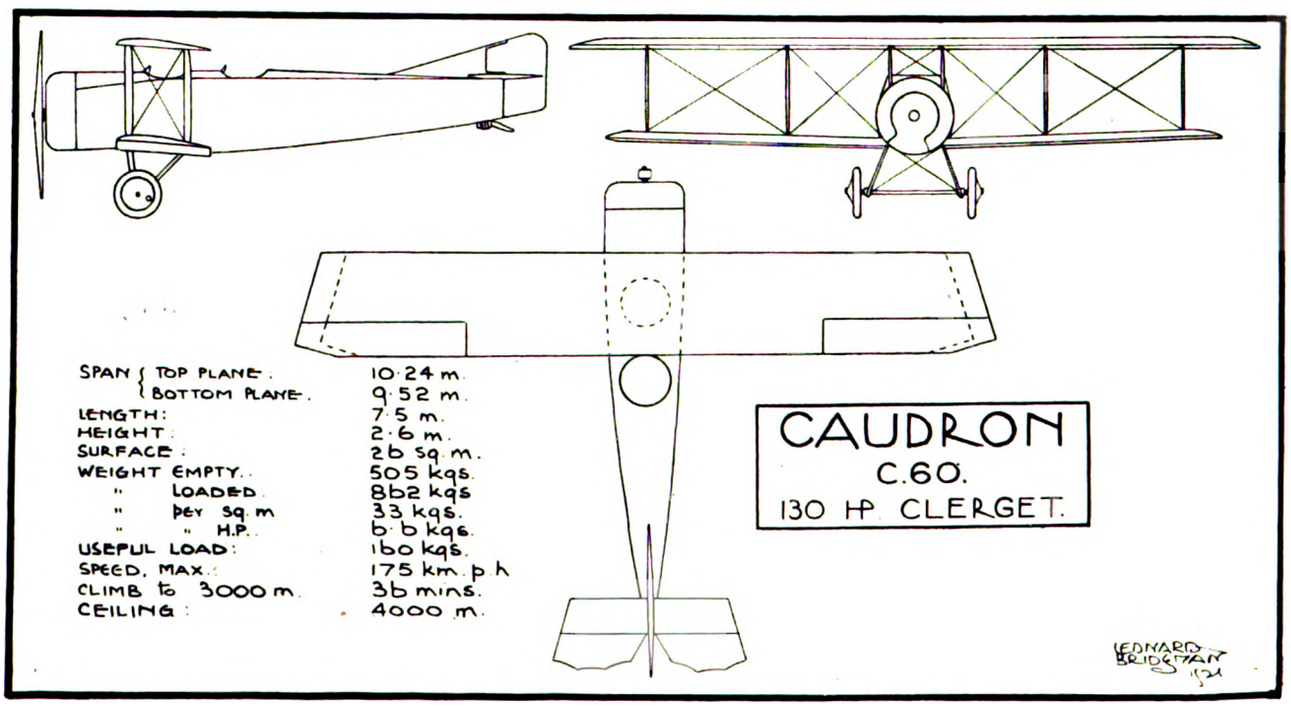
These two machines differ only in regard to their engines. The C59 is fitted with the 140 h.p. Hispano-Suiza engine, and is used for touring and advanced training work. The C60 is fitted with the 130 h.p. Clerget, and put up a very good performance in the 1921 Michelin Cup Competition.

There is nothing particularly notable about these machines, which are of normal tractor type, and should be extremely safe in the hands of even indifferent pilots.

The specification of the C59 is attached, that of the C60 will be found on the scale drawing.

Specification of the Caudron C59.

Purpose	**Touring or Training.**
Span (top)	**10.24 m.**
Span (bottom)	**9.52 m.**
Overall length	**7.8 m.**
Overall height	**2.9 m.**
Total area of wings	**26 sq. m.**
Engine	**140 h.p. Hispano-Suiza.**
Weight empty	**590 kgs.**
Weight loaded	**875 kgs.**
Performance.	
Max. speed, low down	175 km.p.h.



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CAUDRON—*continued.*

The Caudron C59 (140 h.p. Hispano-Suiza engine).

THE CAUDRON C.61.

This machine is a three-engined passenger carrier, designed to carry pilot and seven others.

The general arrangement is that of the usual tractor biplane, with an engine in the nose of the fuselage, but with the addition of two other engines on the wings. There is a minor undercarriage beneath the nose of the fuselage, and one edition of the normal Caudron short skid and wheel undercarriage is carried beneath each wing engine.

The pilot's seat is immediately behind the nose engine, and ahead of the wings. Behind this is the usual cabin, with seats for six.

The wing engines are carried on bearers, between special struts, entirely without any cowling, which, considering how clean an engine the Hispano is, and the relatively low speed of the whole machine, probably detracts little from the performance.

The Caudron C.61 (three 140 h.p. Hispano-Suiza engines).

On the other hand, it undoubtedly adds greatly to the accessibility of the engines and probably reduces the clatter audible in the cabin.

Otherwise, the machine is notable only for the fact that it is the first Caudron of which one has any knowledge whose wings are not braced by piano wire. Streamline wires are employed throughout the wing system.

Specification of the Caudron C.61.

Purpose	Passenger Transport.
Span	24.14 m.
Length overall	14.6 m.
Height overall	4.0 m.
Total surface	104 sq. m.
Engines	3—140 h.p. Hispano-Suiza.
Weight empty	2,200 kgs.
Weight loaded	3,480 kgs.
Useful load	840 kgs.
Wing loading	33.5 kgs. per sq. m.
Weight per h.p.	8.3 kgs.
No. of passengers (crew included)	8.

THE CAUDRON 67 AND 68.

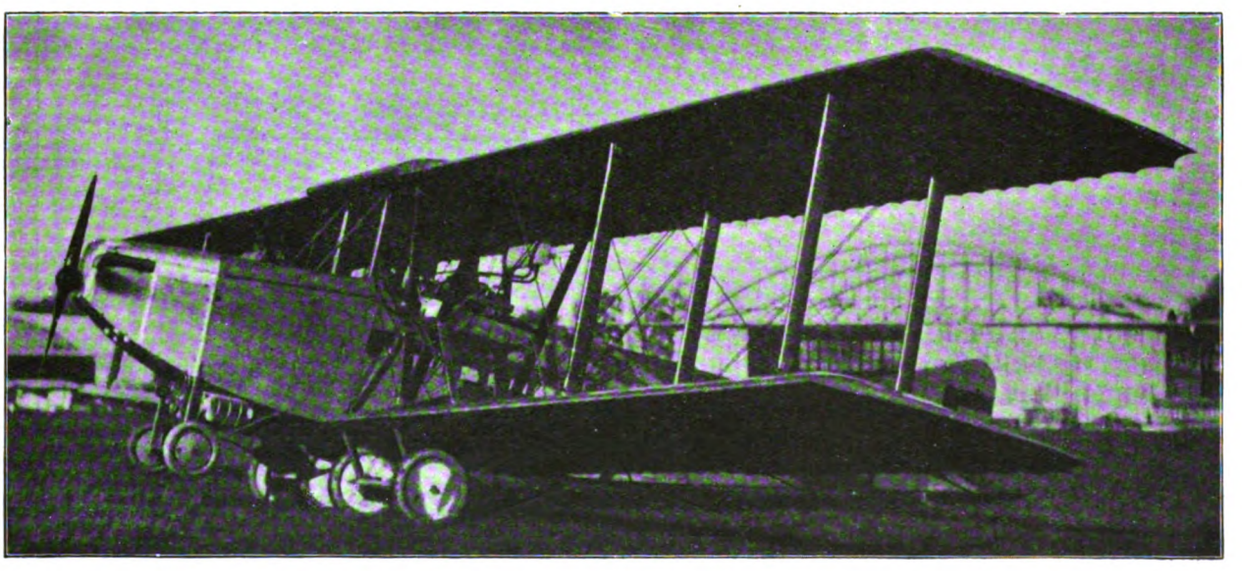
The Caudron firm showed at the 1922 Paris Show a pair of small sporting type tractor biplanes, of similar dimensions. One, fitted with the 35 h.p. Anzani engine, was a single-seater; the other, with a 50 h.p. engine of the same make, was a folding wing two-seater.

Specification of the Caudron 67.

Type	Sporting Single-seater.
Span	7.65 m. (25 ft.).
Length	5.80 m. (19 ft.).
Area	16 sq. m. (172 sq. ft.).
Weight loaded	326 kgs. (717 lbs.).
Engine	35 h.p. Anzani.
Wing loading	20.4 kgs./sq. m. (4 16 lbs./sq. ft.).
Power loading	9.3 kgs./h.p. (20 lbs./h.p.)

Specification of the Caudron 68.

Type	Sporting Two-seater.
Span	7.65 m. (25 ft.).
Length	5.80 m. (19 ft.).
Area	16 sq. m. (172 sq. ft.).
Weight loaded	451 kgs. (992 lbs.).
Engine	45 h.p. Anzani.
Wing loading	28 kgs./sq. m. (5.8 lbs./sq. ft.).
Power loading	9 kgs./h.p. (19.8 lbs./h.p.).
Speed	125 km.h. (78 m.p.h.).



The Caudron 81 Passenger Carrier.

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CAUDRON—*continued.*

THE CAUDRON C.81.

A three-engined passenger carrier of similar general arrangement to the C.61, but with two 370 h.p. Lorraine-Dietrich engines and one 270 h.p. Lorraine-Dietrich engine in the nose of the fuselage.

A cabin for 10 passengers is fitted.

Specification.

Wing area	**145 sq. m. (1,560 sq. ft.).**
Weight loaded	**6,400 kgs. (14,000 lbs.).**
Wing loading	**43 kgs./sq. m. (9 lbs./sq. ft.).**
Power loading	**5.97 kgs./h.p. (13.2 lbs./h.p.).**
Max. speed	**175 km.h. (107 m.p.h.).**

THE CAUDRON C.91.

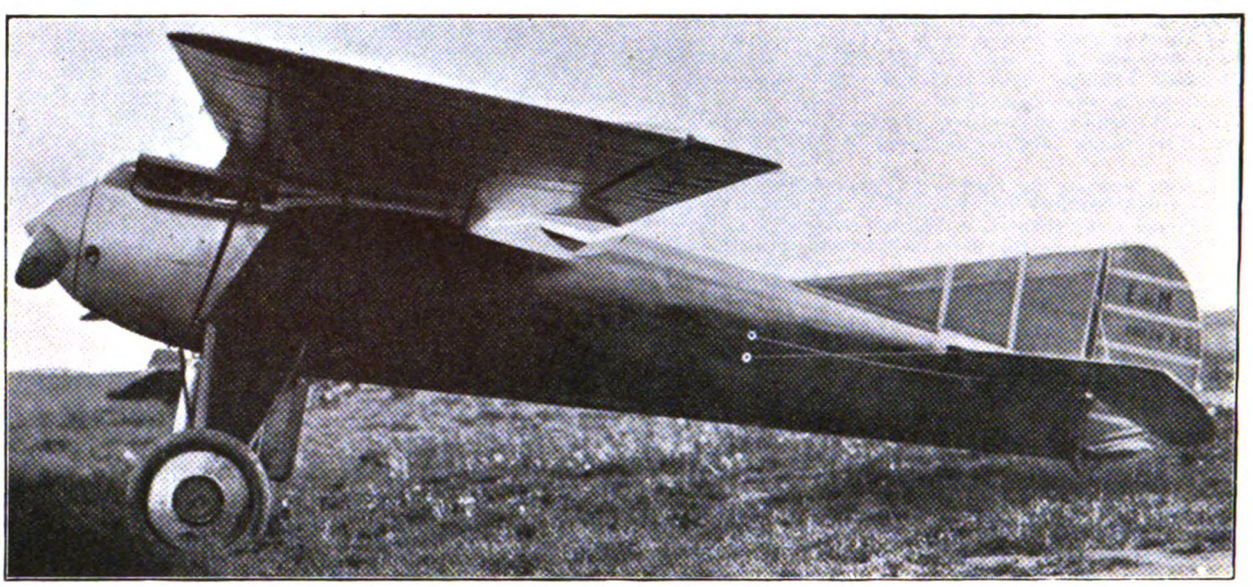
A single-engine machine for four passengers and luggage. No information is available except that given in the specification.

Specification.

Wing area	**65 sq. m. (698 sq. ft.).**
Weight loaded	**2,510 kgs. (5,520 lbs.).**
Engine	**Renault, 300 h.p.**
Wing loading	**38.6 kgs./sq. m. (7.9 lbs./sq. ft.).**
Power loading	**8.36 kgs./h.p. (18.4 lbs./h.p.).**
Max. speed	**166 km.h. (103 m.p.h.).**

DE MARÇAY.

D



The De Marçay 4C.1. Fighter.

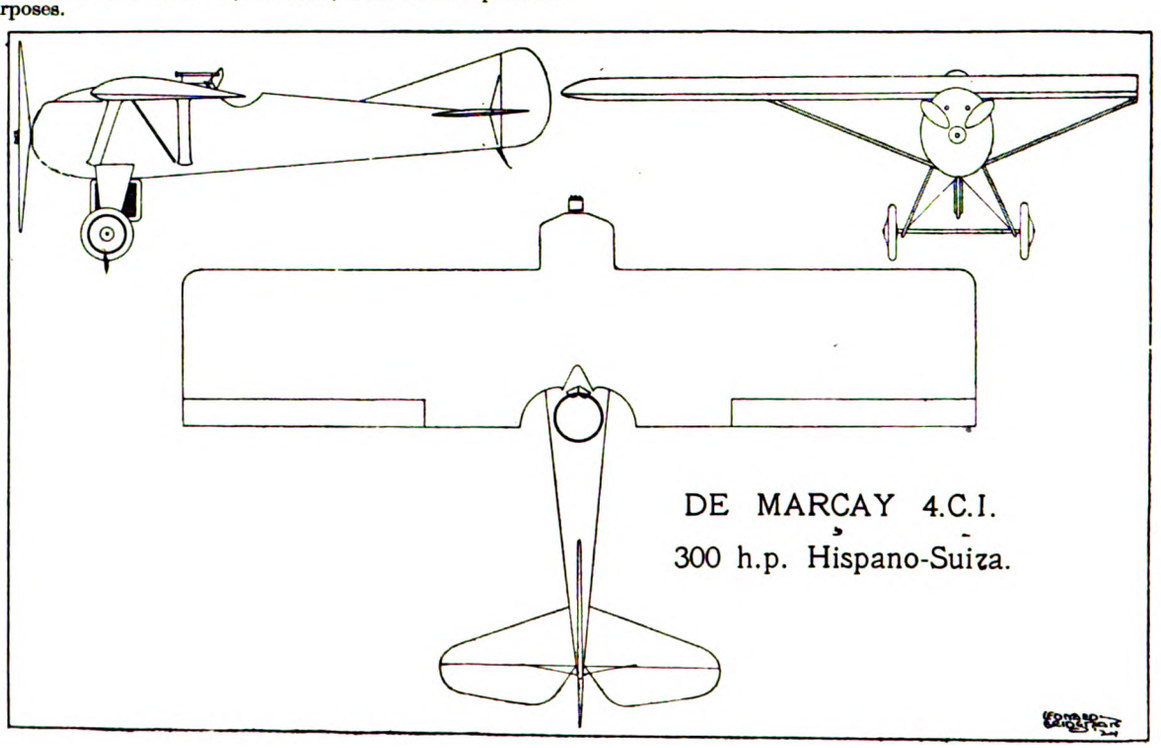
Société Anonyme d'Etudes et de Construction Aeronautique 5, Avenue du Roule, Neuilly-sur-Seine.

M. Edmond de Marçay, whose name was well known in 1913 as the financier of the de Marçay-Moonen sea-monoplane which folded its wings, blossomed forth during the War as a constructor of war machines. These acquired a good reputation for workmanship, and he proceeded to build some small high-speed experimental machines, which, however, were not adopted for war purposes.

He has produced several minute machines for peace-flying, described in the 1920 edition of this annual.

A new company with the above title under the directorship of M. de Marçay was formed in 1922.

Have now in course of construction a number of aircraft for military purposes.



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DE MARÇEY—*continued.*

THE DE MARÇAY TYPE 4C.1.

A single-seat fighter of the monoplane type. A monocoque fuselage is surmounted by a thick section wing, the centre section being faired into the fuselage on the under side. The wing is braced by a pair of tubular struts on each side, running from the bottom of the fuselage to well out on the span.

The undercarriage is a normal Vee type, but with both legs encased in a single streamlining. The engine is a 300 h.p. Hispano-Suiza, cooled by a Lamblin radiator carried between the undercarriage limbs. A Letombe starter is carried.

Specification.

Span	**10.0 m. (32 ft. 10 in.).**
Length	**6.7 m. (22 ft.).**
Height	**2.32 m. (7 ft. 7 in.).**
Wing area	**20 sq. m. (215 sq. ft.).**
Weight light	**810 kgs. (1,782 lbs.).**
Weight of fuel	**210 kgs. (462 lbs.).**
Weight loaded	**1,240 kgs. (2,730 lbs.).**
Wing loading	**62 kgs./sq. m. (12.7 lbs./sq. ft.).**
Power loading	**4.1 kgs./h.p. (9.1 lbs./h.p.)**
Speed at 4,000 m. (13,120 ft.)	**270 km.h. (167 m.p.h.).**
Ceiling	**9,000 m. (29,500 ft.).**

DEWOITINE.

Constructions Aeronautiques E. Dewoitine, 22, Rue Lafayette Toulouse.

This is a new firm which has started operations in 1922.

The firm has distinguished itself as a constructor of successful light aeroplanes and gliders, and is doing much work with new types of both military and commercial aircraft.

THE DEWOITINE SINGLE-SEAT FIGHTER.

This is an all-duralumin monoplane with rigid bracing. The fuselage, of oval section, is built on four main and a number of auxiliary longerons, and is covered with sheet metal panels .5 m/m. thick.

The wing is of a thick section, tapering both in chord and thickness to the tips. It is carried above the fuselage, level with the pilot's eye, and is thinned down and cut back to the rear spar on the centre line, ahead of the pilot. It is braced by a pair of struts on each side, running up from the bottom of the fuselage at an angle of about 45°.

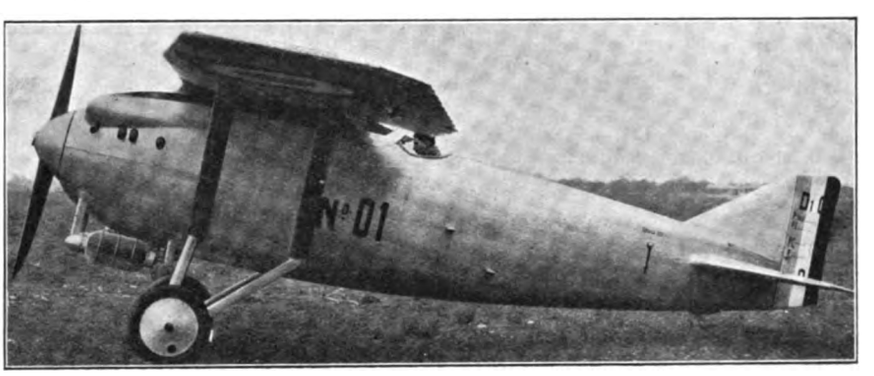
The wing spars are of drawn duralumin and the ribs are of duralumin tube. The covering is of fabric.

The undercarriage and tail unit are of conventional form.

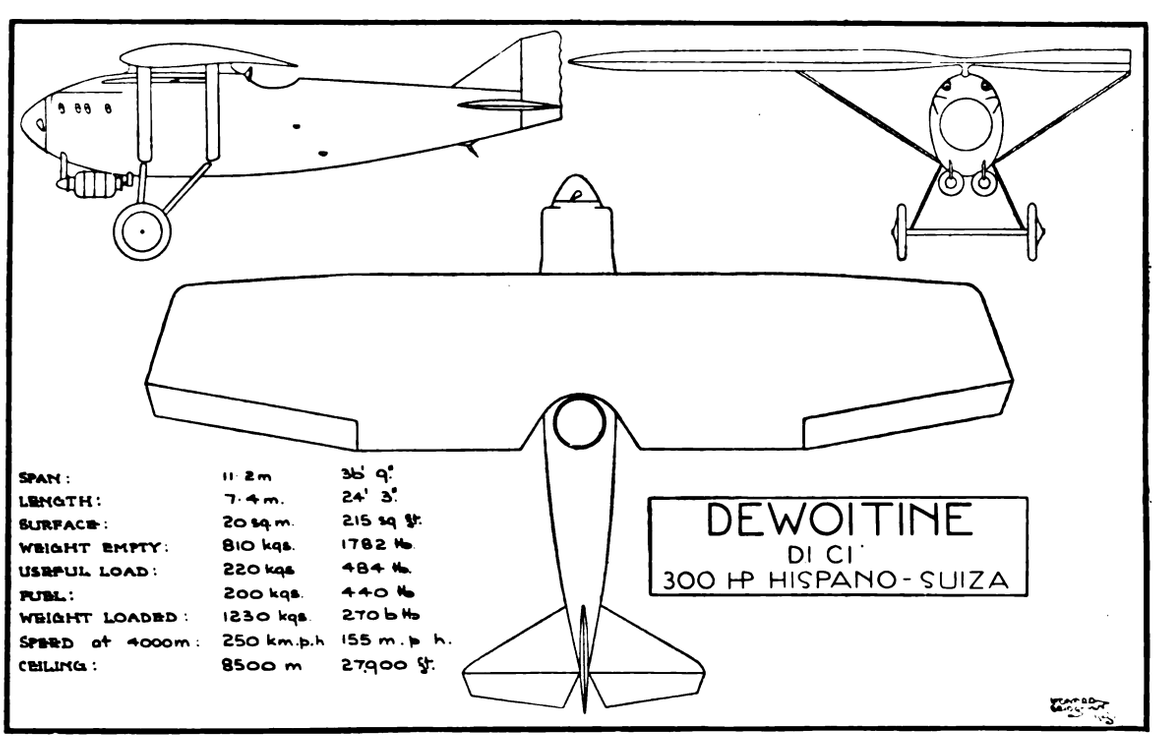
This is a development of the machine illustrated.

Specification.

Span	**12.0 m. (39 ft. 5 in.).**
Length	**7.55 m. (24 ft. 9 in.).**
Height	**2.85 m. (9 ft. 5 in.).**
Wing area	**20 sq. m. (215 sq. ft.).**
Weight light	**780 kgs. (1,715 lbs.).**
Weight loaded	**1,200 kgs. (2,640 lbs.).**
Engine	**Hispano-Suiza, 300 h.p.**
Wing loading	**60 kgs./sq. m. (12.3 lbs./sq. ft.).**
Power loading	**4.0 kgs./h.p. (8.8 lbs./h.p.)**
Max. speed	**260 km.h. (161 m.p.h.).**
Ceiling	**9,000 m. (29,500 ft.).**



The Dewoitine D1C1 Fighter, an earlier version of the machine now described.


DEWOITINE
DI CI
300 HP HISPANO-SUIZA
SPAN: 11·2m 36' 9"
LENGTH: 7·4m. 24' 3"
SURFACE: 20 sq.m. 215 sq ft.
WEIGHT EMPTY: 810 kgs. 1782 lbs
USEFUL LOAD: 220 kgs 484 lbs
FUEL: 200 kgs. 440 lbs
WEIGHT LOADED: 1230 kgs. 2706 lbs
SPEED at 4000m: 250 km.p.h 155 m.p.h.
CEILING: 8500 m 27900 ft.

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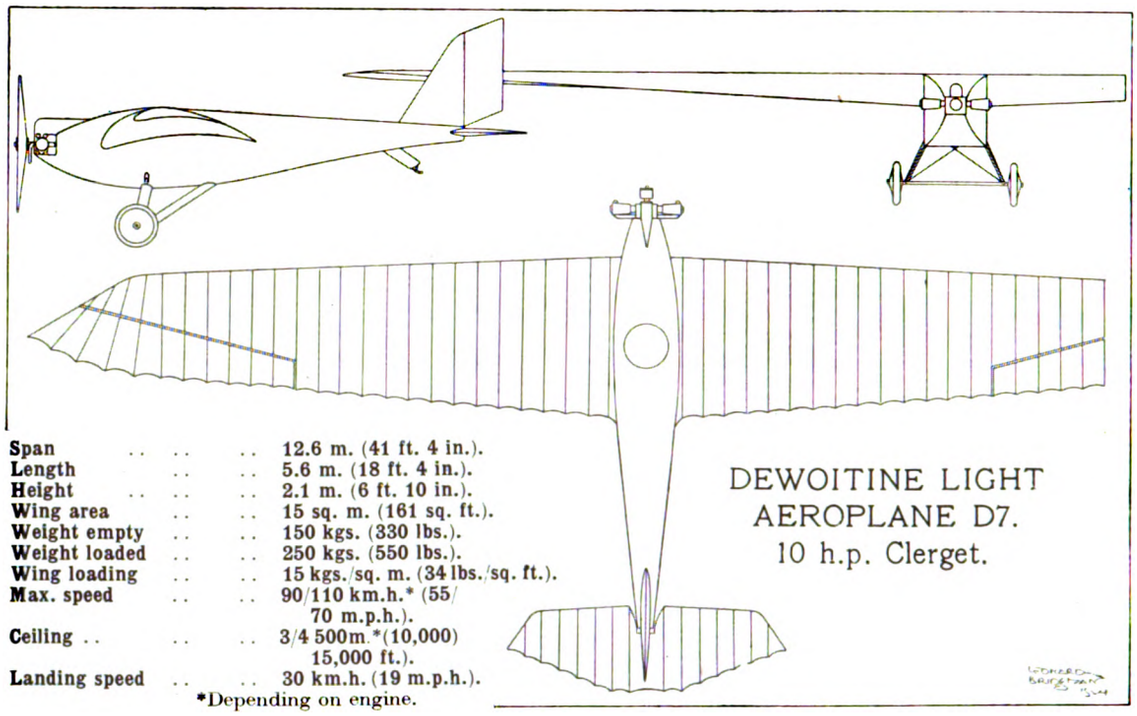
DEWOITINE—*continued.*



Span	12.6 m. (41 ft. 4 in.).
Length	5.6 m. (18 ft. 4 in.).
Height	2.1 m. (6 ft. 10 in.).
Wing area	15 sq. m. (161 sq. ft.).
Weight empty	150 kgs. (330 lbs.).
Weight loaded	250 kgs. (550 lbs.).
Wing loading	15 kgs./sq. m. (34 lbs./sq. ft.).
Max. speed	90/110 km.h.* (55/70 m.p.h.).
Ceiling	3/4 500m.*(10,000) 15,000 ft.).
Landing speed	30 km.h. (19 m.p.h.).

*Depending on engine.

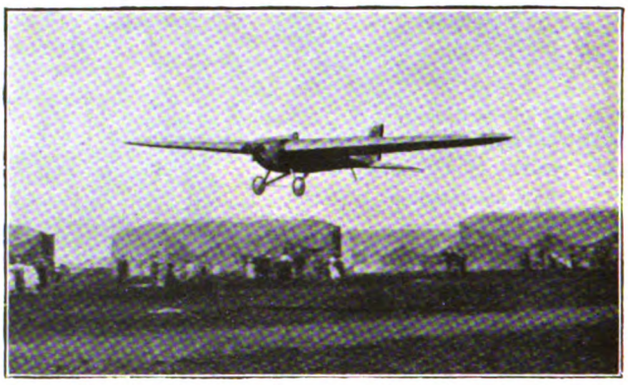
THE DEWOITINE LIGHT AEROPLANE D.7.

Derived from the very successful Dewoitine glider, this light aeroplane, flown by Barbot, has given excellent results. It is a thick wing cantilever monoplane with the wing on top of the fuselage.

The wing section is of the Joukowski type and the wing tapers both in chord and in camber from roots to tip. The spars are three-ply and ash boxes, and the ribs of spruce and pine. The wings are readily demountable from the fuselage and may be stowed alongside the fuselage for transport.

The fuselage has ash longerons, with three-ply bulkheads, and is plywood covered. The section is rectangular. The tail consists of fin and rudder and of a totally movable tail plane, partly balanced. These surfaces are framed in duralumin tubes.

A V undercarriage of duralumin tubes is fitted. The machine may be fitted with any suitable engine of 750 to 1,500 c.c. cylinder capacity, a 16 h.p. 2-cylinder Clerget, a 4-cylinder double opposed Vaslin, or the 4-cylinder Sergant having been used.



The Dewoitine Light Aeroplane.

DITS-MOINEAU.

Les Etablissements Henri Dits, 49, Rue de la Tombe Issoire, Paris.

This firm produces aircraft to the designs of M. René Moineau, a very early pilot of Breguet machines, and the designer during the war of a curious machine with twin airscrews driven from a single Salmson engine set athwartships in the fuselage. (See "All the World's Aircraft" of 1919.)

They were in 1922 building two all-metal machines, one a flying-boat, the other a land machine, both intended specially for tropical service.

Nothing further has been heard of these machines.

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FARMAN.

Henri and Maurice Farman, 167, Rue de Silly, Billancourt (Seine). *School*: Toussus le Noble, Versailles.

Established by H. Farman in 1908. Maurice Farman established works a little later. In 1912 the two brothers combined. Present works were opened in January, 1912.

The aeroplane factory of Henri and Maurice Farman, at Billancourt (Seine), is said to have been able to produce machines of various types at the rate of ten every day. The factory is two miles long, and, with its extensive facilities and a force of 5,000 employees, the Farman establishments produced all parts of the aeroplane at the Billancourt factory, including all the woodwork and metal parts.

A portion of the works have now been diverted to the production of automobiles.

Of the peace-time aircraft products, the "Goliath" passenger carrier is in regular use on the London-Paris service.

THE FARMAN "SPORT."

This—sometimes known as "David" in contradistinction to "Goliath"—is a small two-seater biplane of the popular variety, fitted with the 70 h.p. Anzani.

The fuselage is a rectangular section affair built on longerons and struts, covered with glued and nailed on three-ply. The engine is mounted in the usual way on the front end, with the pilot's seat just behind the engine—followed by a second seat very close up to the first.

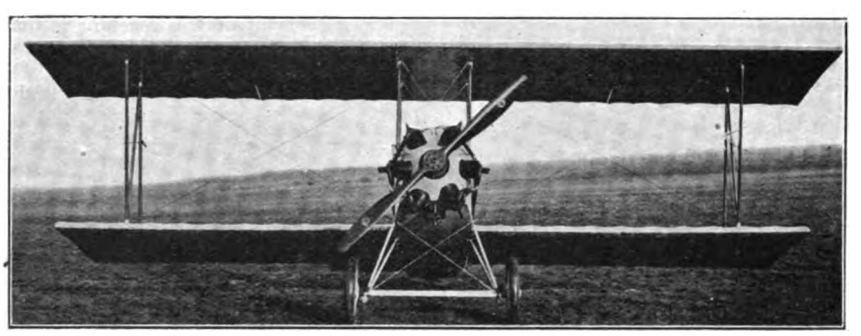
The centre section upper wing is supported on four rather lanky vertical struts.

The wings are heavily staggered, and are mounted on one pair of N struts on each side. Flying and landing wires are double 14G piano wire. Ailerons are fitted on upper wings alone.

Except the rudder, which has a curved upper extremity, all the surfaces are of the Farman cut-off-square type.

The following table gives the characteristics of the machine :—

Span	**7 m. 110.**
Length overall	**6 m. 135.**
Weight empty	**200 kg.**
Total load	**200 kg.**
Maximum speed	**10 k.p.h.**
Minimum speed	**60 k.p.h.**



Front view of the Farman "Sport."

THE FARMAN "GOLIATH"

This is the most successful twin-engined passenger carrier in France. It has two cabins, one aft the wing, and one, a kind of observation car, in front. The pilot and mechanic sit between the two cabins level with the leading edge of the wings. The machine is of the usual wood and wire construction. There is no stagger to the wings, which are of very deep section and cut off square at the tips, in accord with Farman practice. The ailerons are also aquare-cut. A noticeable feature is the streamlining of the undercarriage struts which give the impression that the machine is wearing trousers.

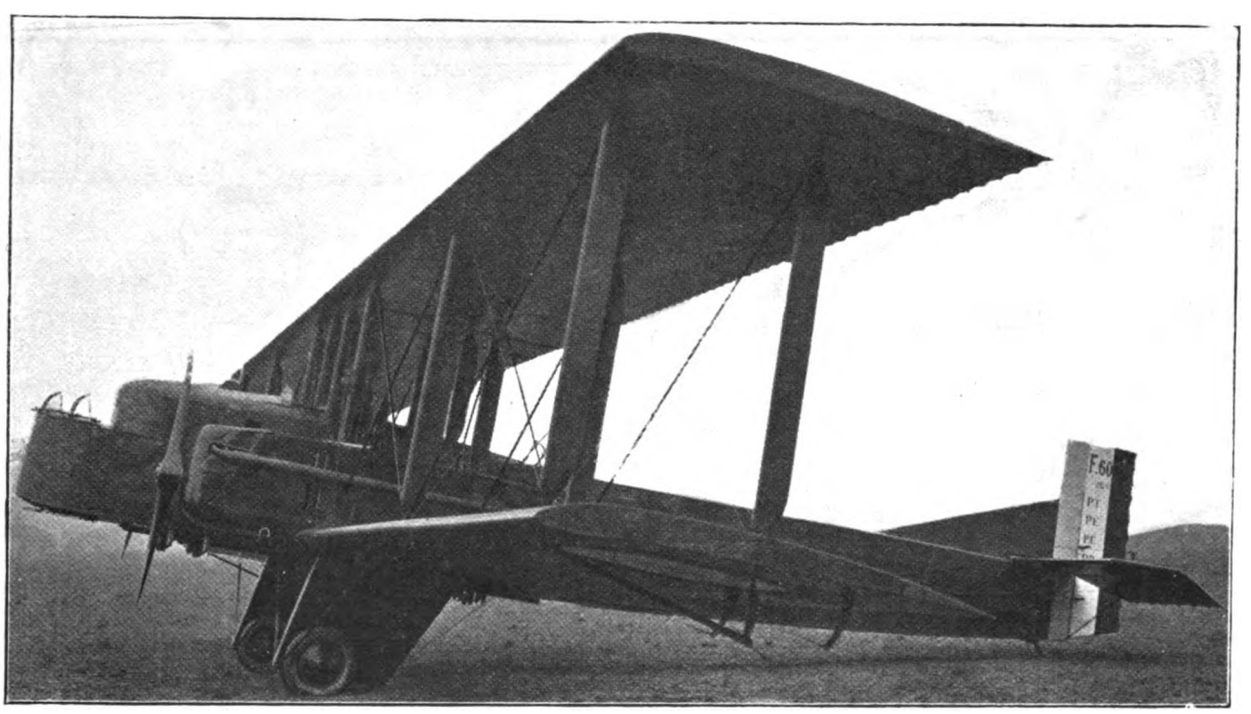
Specification of the "Goliath."

Type of machine	**Twin-engine Passenger Carrier.**
Span	**28 m.**
Chord	**3 m. 065.**
Overall length	**1 m.**
Maximum height	**5 m.**
Span of tail	**5 m. 500.**
Engine type and h.p.	**2 Salmson. 260 h.p.**
Performance.	
Speed low down	120 km.p.h.

The Goliath has recently been equipped with two 350 h.p. Renault engines for the London-Paris services, and a version has also been produced with two Lorraine Dietrich engines of 400 h.p.

The "Goliath" is in service in the French Air Service as a bomber, and a specimen of this type is shown in a photograph below.

For the purpose of competing in various contests for "commercial" machines and for record breaking purposes, a four-engined version of the "Goliath" with two tandem pairs of 260 h.p. Salmson engines on each lower wing has been built.



A Farman Military Goliath (370 h.p. Lorraine-Dietrich engines).

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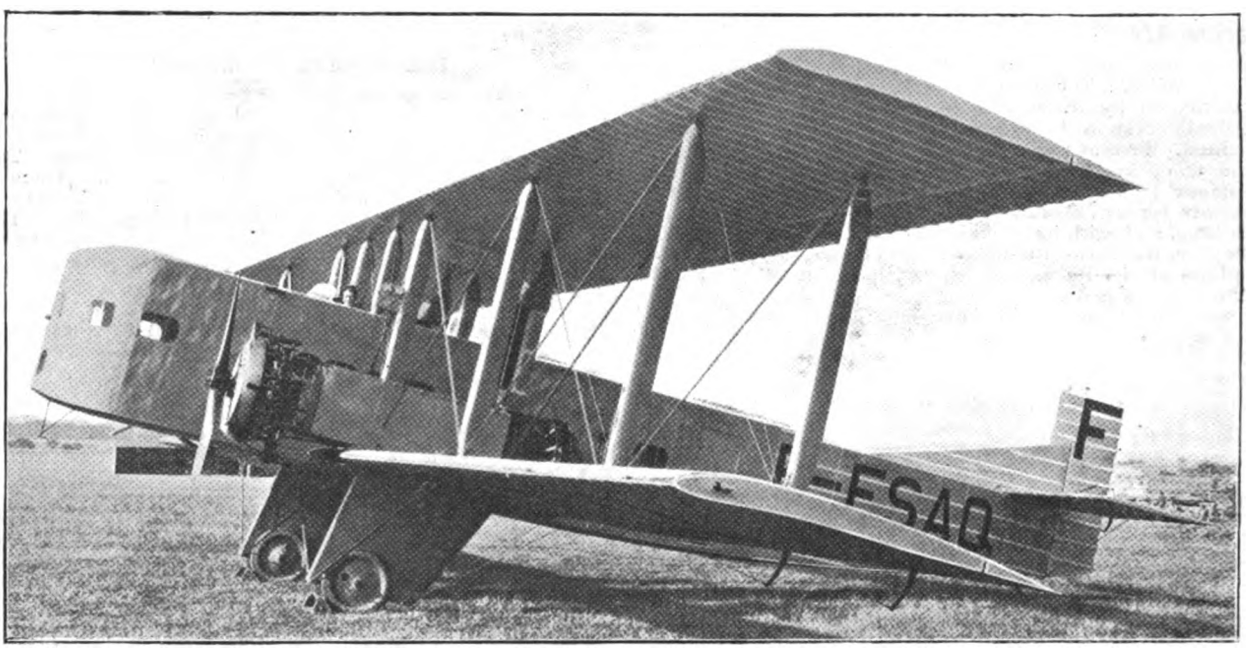
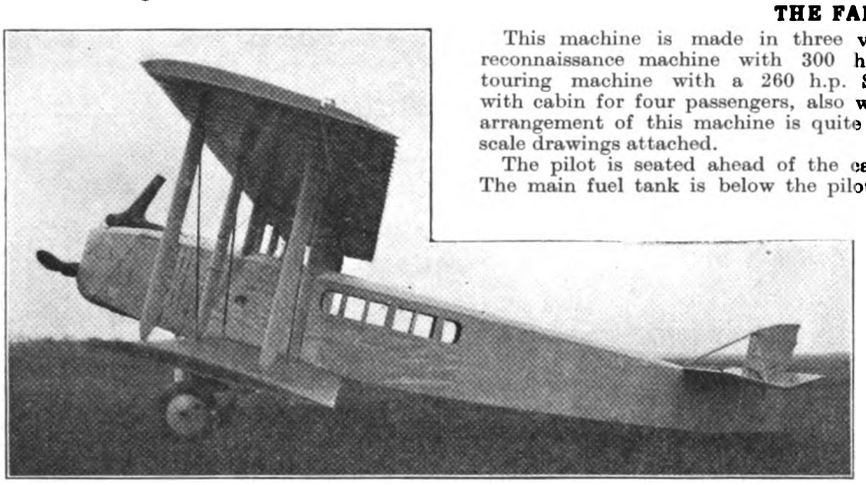
***FARMAN**—continued.*



The four-engined Farman "Goliath."



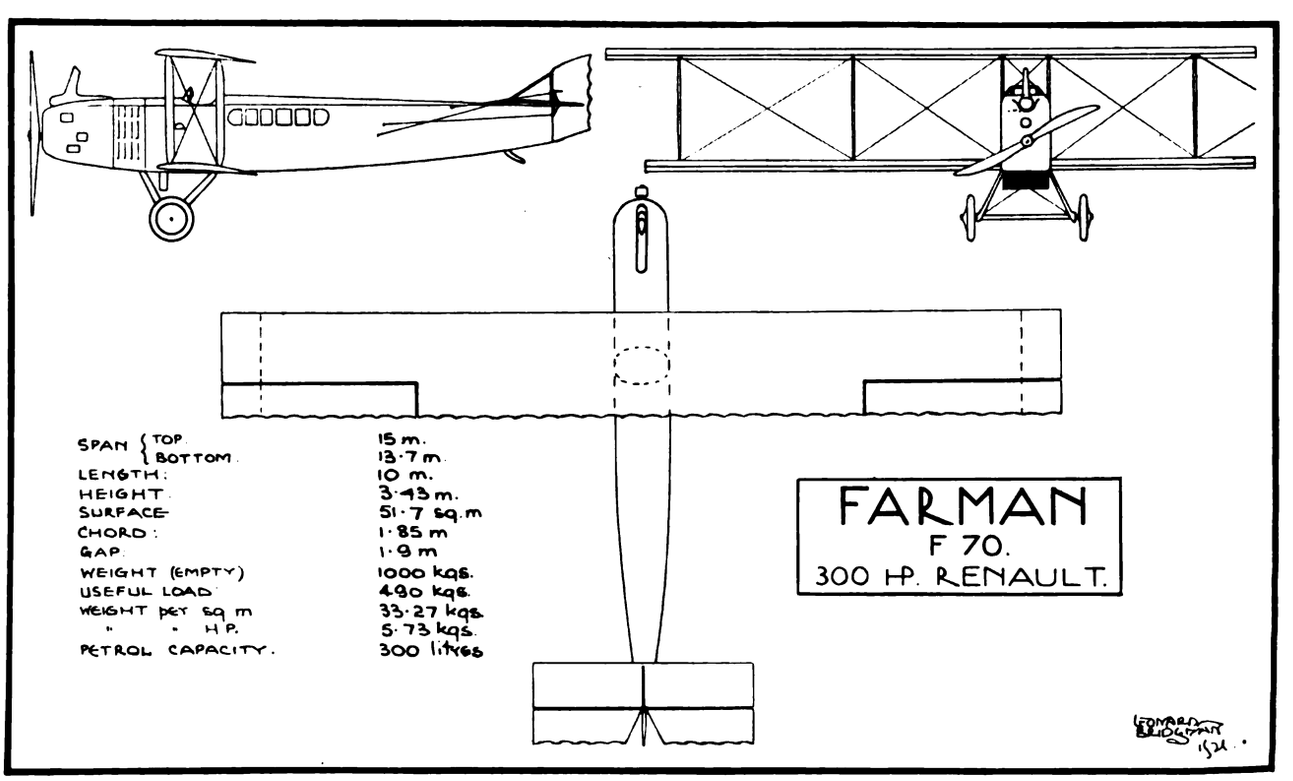
THE FARMAN F70.

This machine is made in three versions, as a two-seater fighting and reconnaissance machine with 300 h.p. Renault engine, as a three-seater touring machine with a 260 h.p. Salmson, and as a limousine machine with cabin for four passengers, also with a 300 h.p. Renault. The general arrangement of this machine is quite clearly shown by the photographs and scale drawings attached.

The pilot is seated ahead of the cabin, beneath the upper, centre section. The main fuel tank is below the pilot's seat and contains 180 litres. Petrol is extracted thence by a Weymann exhauster and sent to a gravity tank which supplies the carburetter.

The cabin contains two cross seats, facing one another, each giving space for two passengers, and entrance is given by a side door.

The Farman F70 (300 h.p. Renault engine).



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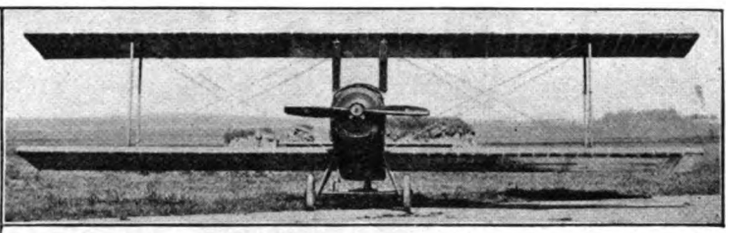
FARMAN—*continued.*



The Farman type F90 (300 h.p. Salmson Engine).

THE FARMAN F90.

A single-engine biplane, with wings fitted with only one pair of struts per side, carrying six passengers, plus pilot, with the 300 h.p. Salmson engine.

Has the usual Farman characteristics of wings cut off square, of a large gap to chord ratio, and of relatively simple construction. The most notable feature is the arrangement of radiators alongside the front centre section struts.

The passengers are carried in a cabin, which follows immediately behind the engine bulkhead, and the pilot sits right aft, behind the cabin.

This machine won the Grand Prix du Transport in 1922.

Specification of the Farman F90.

Purpose	**Six-Passenger Commercial Biplane.**
Span	**14 m.**
Gap	**2.3 m.**
Chord	**2.3 m.**
Overall length	**9.3 m.**
Overall height	**3.9 m.**
Total area of wings	**62 sq. m.**
Engine	**300 h.p. Salmson.**
Weight empty	**1,100 kgs.**
Weight loaded	**2,350 kgs.**
Weight per sq. m.	**33 kgs.**
Weight per h.p.	**7.81 kgs.**
Useful load	**1,250 kgs.**

THE FARMAN FOUR-ENGINED BOMBER (B.N.4).

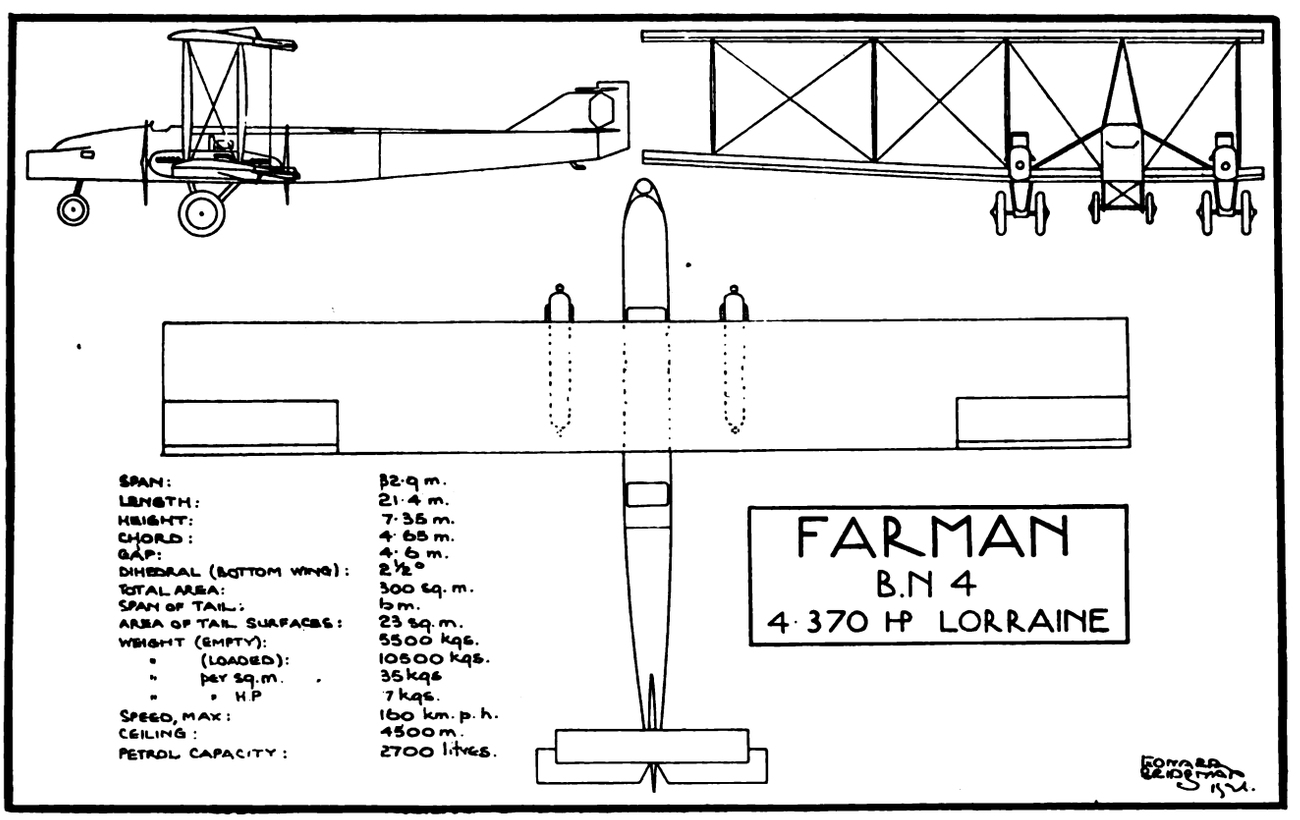
This is an enormous night-bombing machine built for the French Air Service. The general design, shown in a scale drawing, is of the same type as the war-time Handley Page, and the four-engined German Staaken machines, and calls for little comment.

The construction is mainly in timber, and all the important members are built up. The wing spars, in particular, are somewhat novel. These are in the form of boxes, built up of spruce, stiffened internally by inclined bulkheads, forming a sort of Warren truss. The completed box is then lapped with two diagonal layers of very thin veneer glued on, and finally with fabric.

Another interesting feature is the balancing of the ailerons. The main ailerons are of very considerable chord, and they are fitted, at their trailing edges with a sort of subsidiary "aileronette" with a chord of only a few inches. These subsidiary flaps are fitted with king posts, coupled by push and pull rods to a fixed point on the rear spars. The main ailerons are operated in the usual manner by king posts and cables. When the main aileron is moved in one direction, the effect on the subsidiary aileron is to move it in the opposite direction, relatively to the aileron proper. The subsidiary surface thus acts toward the main aileron much as an elevator does to the main planes of a machine, and supplies a moment tending to take the operating load off the control connections.

Folding wings are fitted to the machine, in order that it may be stowed in a reasonably-sized shed.

The main dimensions of the machine are given in the specification on the drawing reproduced.



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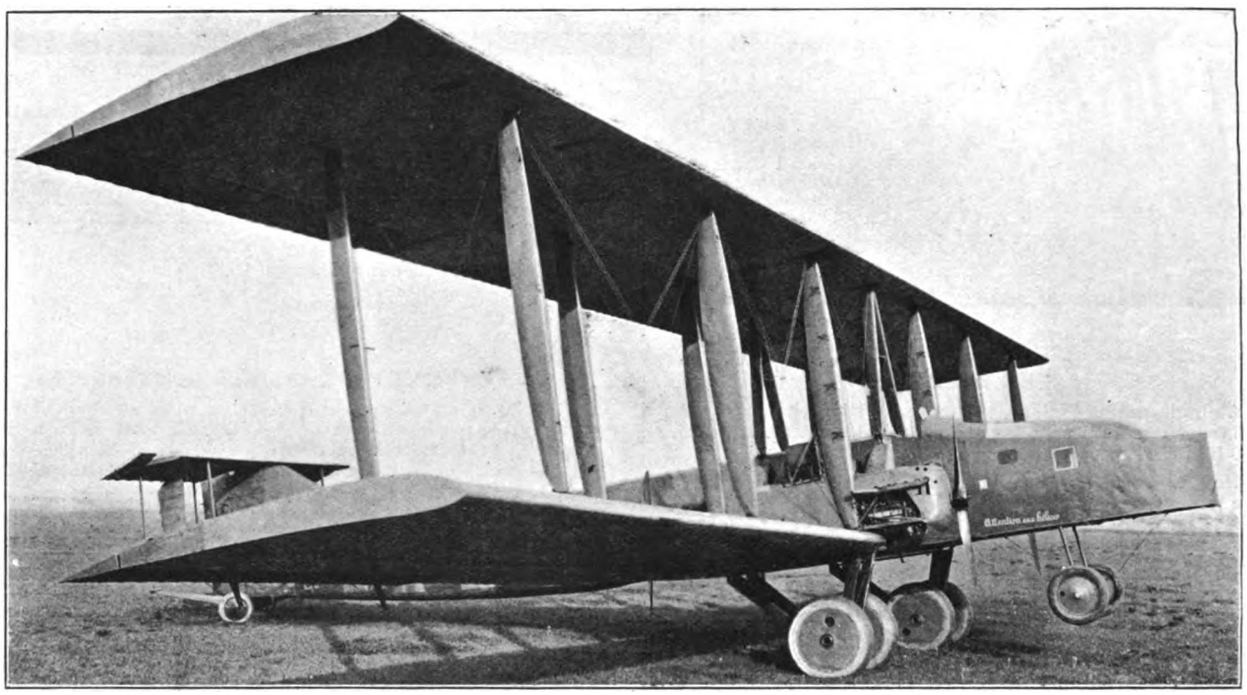
FARMAN—*continued.*



The Farman B.N.4 (four 370 h.p. Lorraine engines).

THE FARMAN B.2 BOMBER.

This machine gives rather the impression that Farmans have tried to build a modified version of the 1912 Military Trials "Avro." This is due to the shape of the body and to the fact that the body depth is equal to the gap between planes.

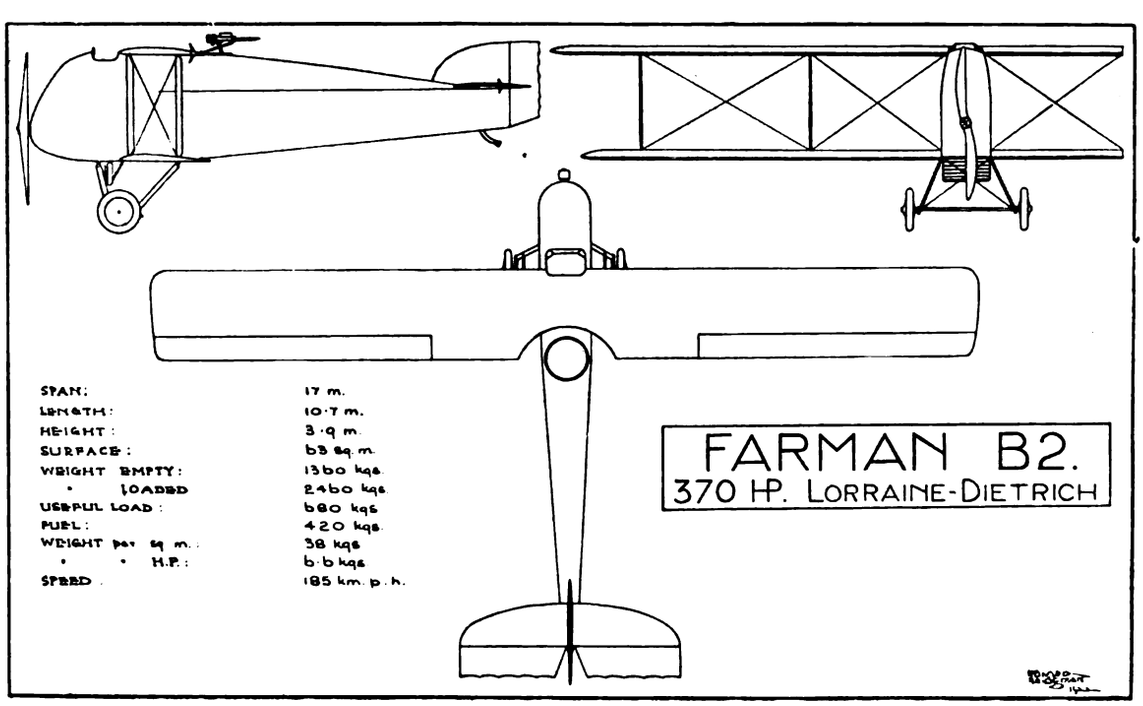
The machine is of metal construction—though it would be somewhat difficult to give a concise description of the type of metal structure employed. Duralumin and steel are the main materials, but it is not easy to arrive at any reason why one or the other is used for any given part of the structure, and one rather gets the impression that the designer having to work to a specification calling for metal construction designed a wooden machine and then put in duralumin members where wood entered into the original design. Regarded as a metal structure it is not very convincing.

Apart from its bi-metallism, the machine is quite an ordinary tractor biplane. It carries a pilot with his head sticking out through what would be the top leading edge if it were not the roof of the fuselage, and an observer aft of the wing.

Specification of the Farman B.2 Bomber.

Span	**55 ft. 10 in.**
Length	**35 ft. 6 in.**
Height	**12 ft. 9½ in.**
Surface	**678 sq. ft.**
Weight empty	**2,997 lbs.**
Weight loaded	**5,420 lbs.**
Useful load	**1,500 lbs.**
Fuel	**923 lbs.**
Engine	**Lorraine-Dietrich, 370 h.p.**
Wing loading	**8 lbs. per sq. ft.**
Weight per h.p.	**14.5 lbs.**

(NOTE.—Metric measures are given on the scale drawing attached.)



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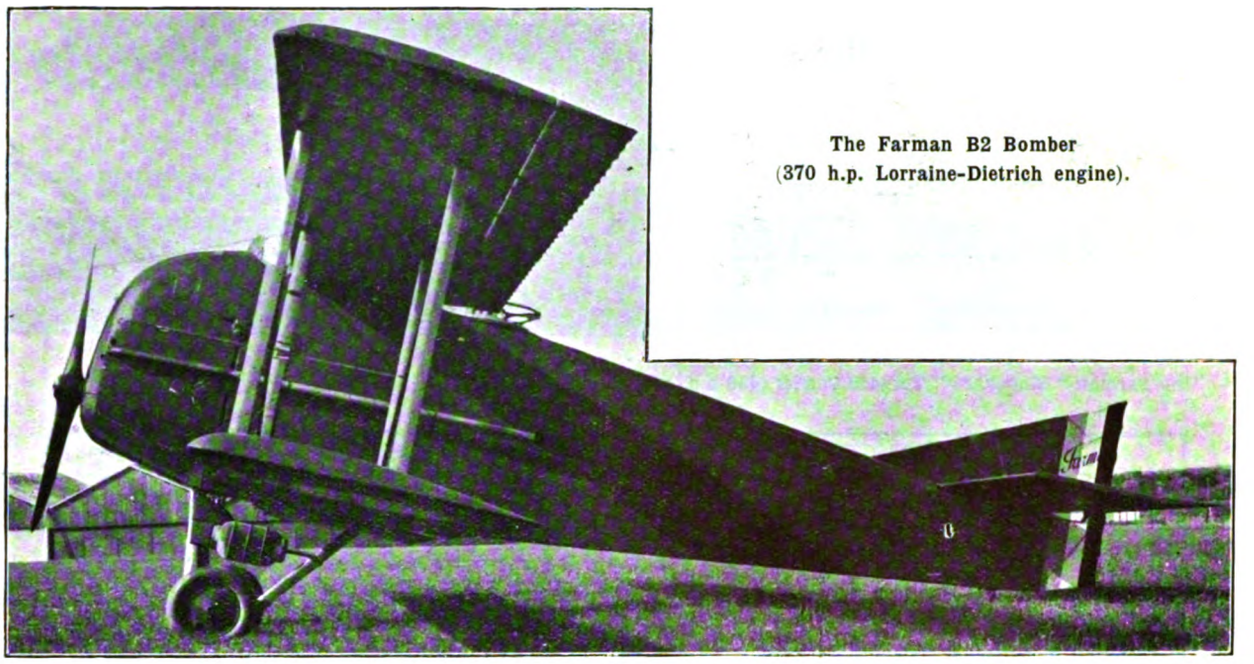
FARMAN—*continued.*



The Farman B2 Bomber
(370 h.p. Lorraine-Dietrich engine).

THE FARMAN A2 (F110).

In this machine, metal construction is used throughout, presumably as a concession to the requirements of the French military authorities.

The machine itself is a two-seater general utility machine, intended for photographic reconnaissance, artillery direction, or the like. In general form, it is a moderate-sized single-bay tractor biplane, with the usual "cut off square" surfaces used by Farmans. No information as to the details of the wing construction are available, but the fuselage is of very simple form, consisting of angle section duralumin longerons, steel tube struts, and steel cross bracing. The joints between longerons and struts are made with flat duralumin gusset plates riveted on, and the bracing wires are attached to these plates.

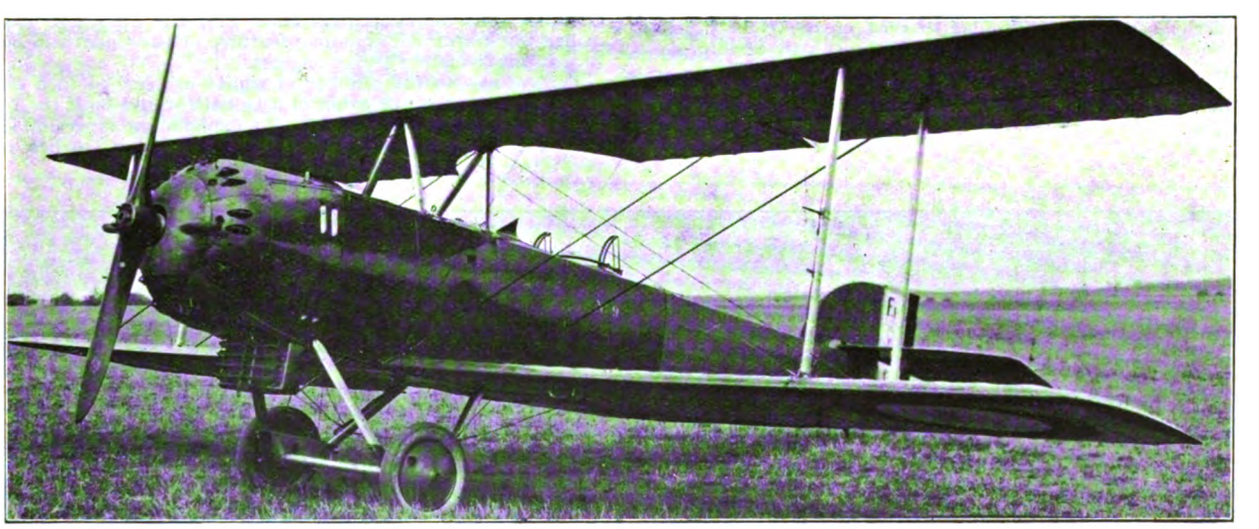
It is stated that no acetylene welding is used in any important part, and that wood is present only in accessory fittings.

The crew of two are seated in tandem cockpits, both aft of the main planes. The engine is mounted on a pressed steel front bearer, and is very completely encowled. A honeycomb radiator is carried below the fuselage.

The attached specification gives all the particulars available.

Specification of the Farman A2 (F110).

Purpose	**Military Reconnaissance.**
Span	**12 m.**
Length overall	**9.115 m.**
Height overall	**3.185 m.**
Chord	**1.65 m.**
Gap	**1.95 m.**
Total wing area	**37 sq. m.**
Span of tail	**3.5 m.**
Area of tail	**5.5 sq. m.**
Engine	**Salmson 260 h.p.**
Weight empty	**735 kgs.**
Weight loaded	**1,420 kgs.**
Useful load	**525 kgs.**
Petrol capacity	**250 litres.**
Oil capacity	**20 litres.**
Wing loading	**38 kgs. per sq. m.**
Weight per h.p.	**5.45 kgs.**
Performance.	
Speed, ground level	191 km.p.h.
Speed, 2,000 m.	189.5 km.p.h.
Speed, 5,000 m.	175.5 km.p.h.
Ceiling	6,600 m.
Climb.	
To 2,000 m...	7 mins. 30 secs.
To 3,000 m...	12 mins. 35 secs.
To 5,000 m...	28 mins. 25 secs.



The Farman all-metal fighter "A2" (260 h.p. Salmson).

N2

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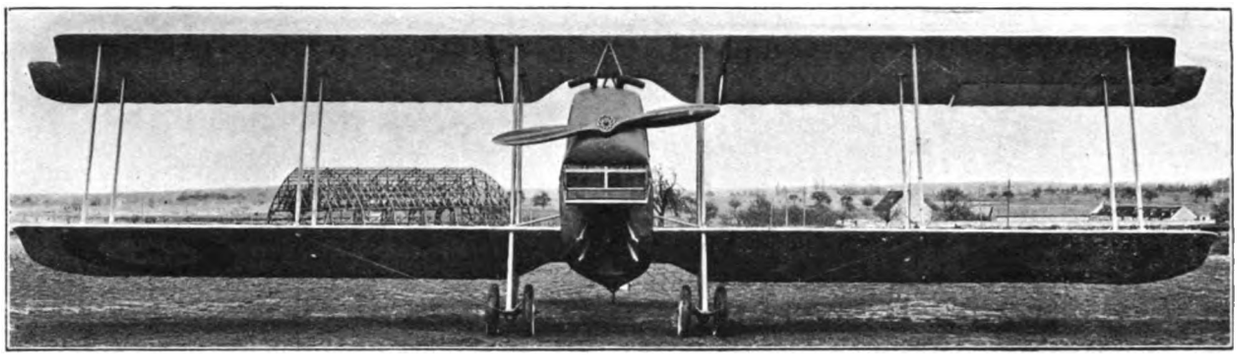
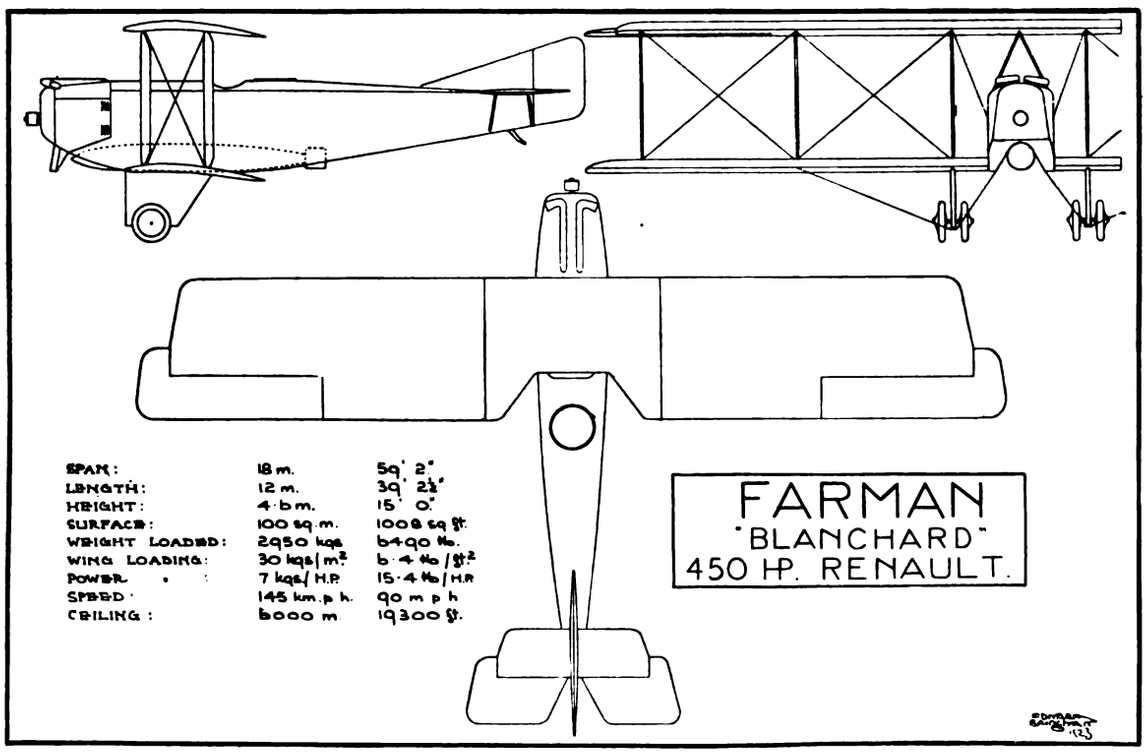


The Farman "Blanchard" Torpedo Carrier (450 h.p. Renault).


SPAN: 18 m. 59' 2"
LENGTH: 12 m. 39' 2½"
HEIGHT: 4·6 m. 15' 0"
SURFACE: 100 sq. m. 1008 sq ft.
WEIGHT LOADED: 2950 kgs 6490 lbs.
WING LOADING: 30 kgs/m² 6·4 lbs/ft²
POWER 7 kgs/H.P. 15·4 lbs/H.P.
SPEED 145 km.p.h. 90 m p h
CEILING: 6000 m 19300 ft.
FARMAN
"BLANCHARD"
450 HP. RENAULT.

THE FARMAN TORPEDO CARRIER "BLANCHARD."

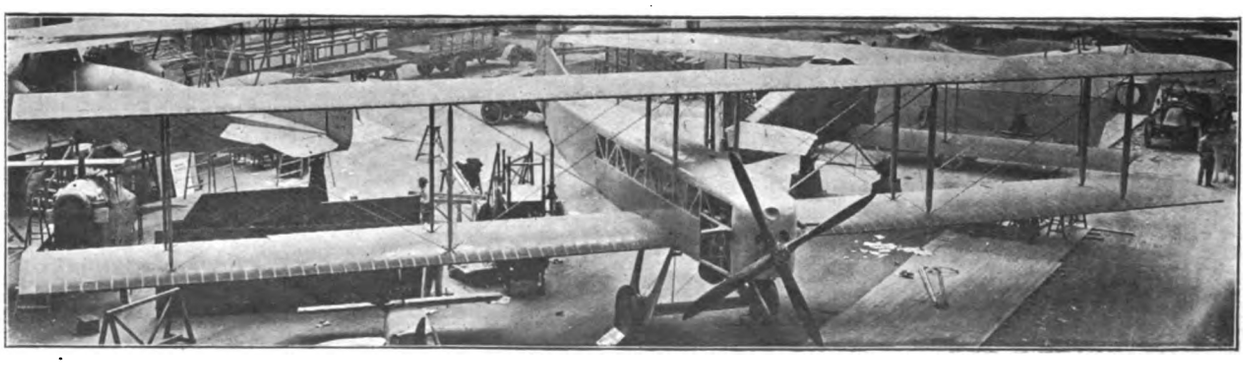
This machine, is a normal single-engine tractor, with unstaggered wings of 18 m. span. The fuselage, covered entirely in three-ply, has worked into its under side a concave receptacle for the reception of a torpedo, and the undercarriage is of the divided type, very similar to that of the Goliath, with one streamlined leg below each of the inner pair of interplane struts.

The scale drawing above gives all details available as to this machine.

THE FARMAN EIGHT-SEATER.

This is a Goliath-like single-engine tractor, fitted with one single 600 h.p. Farman engine. Except for the singleness of motive plant and the fact that it is fitted with a normal Vee type undercarriage, it is almost indistinguishable from the Goliath. The manufacturers state that the intention was to utilize the known aerodynamic features of the Goliath in order to test-out the new Farman engines.

Passengers—to the number of eight—are carried in a cabin which is just what the cabin of a Goliath would be if the front 5 ft. were filled with engine. No explanation is available of why the machine with considerably more h.p. carries only two-thirds the complement of the Goliath.



The Farman eight-seater (600 h.p. Farman engine).

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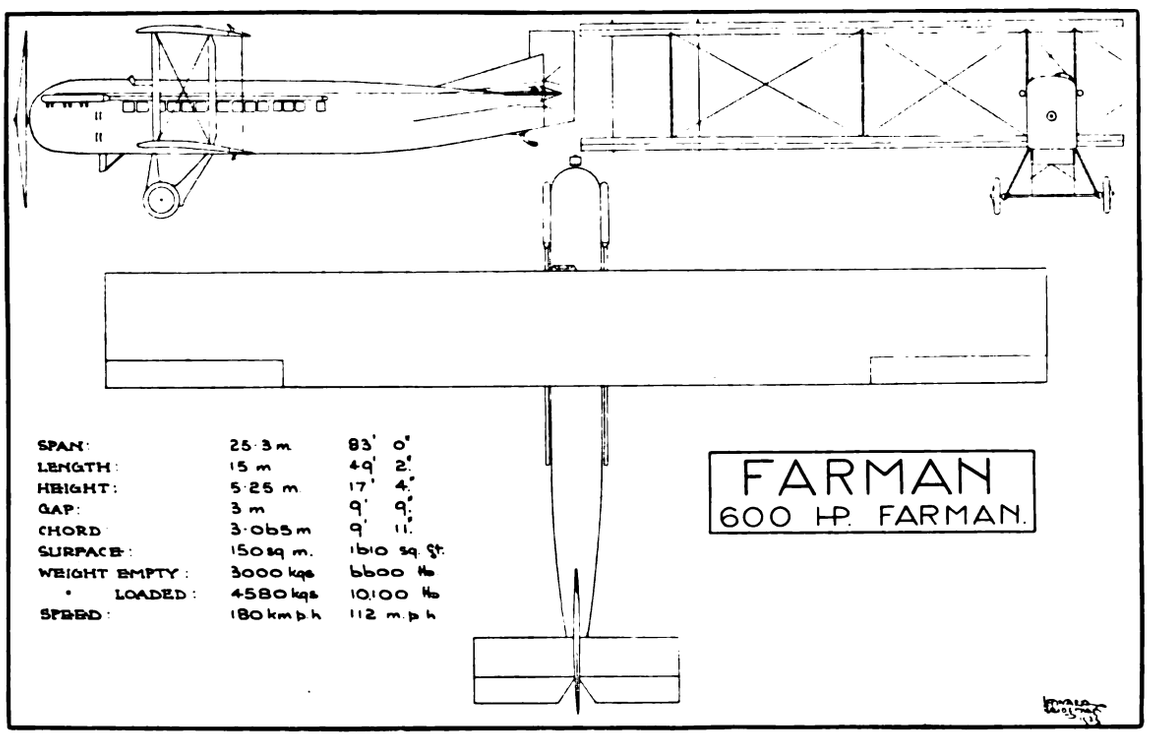
FARMAN—*continued.*


SPAN: 25·3 m. 83' 0"
LENGTH: 15 m 49' 2"
HEIGHT: 5·25 m 17' 4"
GAP: 3 m 9' 9"
CHORD 3·065 m 9' 11"
SURFACE: 150 sq m. 1610 sq ft.
WEIGHT EMPTY: 3000 kgs 6600 lbs
" LOADED: 4580 kgs 10100 lbs
SPEED: 180 km p h 112 m.p.h
FARMAN
600 HP. FARMAN.

THE FARMAN TOURING MONOPLANE.

This is a curious cantilever monoplane, built of wood, of great overall length relatively to its span.

The wings spring from the bottom of the fuselage, and taper very rapidly both in chord and in thickness. As usual, they are cut off square at the tips, which incidentally are about the only things square in the whole machine. The machine is driven by a Hispano-Suiza of 180 h.p. and the pilot and passenger are ensconced in a glass house erected above the main structure of the body in a manner which suggests that it would be unwise to turn the machine over.

The undercarriage has a very wide track, and consists of two Vees attached to the wing spars some distance from the body, together with one inclined strut from the outer edge of the body to the base of the Vees. The wheels are carried on overhung stub axles, and there does not appear to be any shock absorbing device other than that provided by the tyres.

Specification of the Farman Monoplane.

Type	**Touring Two-seater, enclosed cabin.**
Span	**10 m. 800 (35 ft. 10 in.).**
Length overall	**9 m. 500 (31 ft. 2 in.).**
Height overall	**2 m. 300 (7 ft. 6½ in.).**
Wing area	**28 sq. m. (303 sq. ft.).**
Weight empty	**680 kgs. (1,500 lbs.).**
Weight of fuel	**280 kgs. (595 lbs.).**
Useful load	**160 kgs. (352 lbs.).**
Weight loaded	**1,120 kgs. (2,447 lbs.).**
Engine	**Hispano-Suiza, 180 h.p.**
Wing loading	**40 kgs./m². (8.2 lbs./sq. ft.).**
Power loading	**6.25 kgs./h.p. (13.6 lbs./h.p.).**

THE FARMAN F3X.

A four-engined passenger-carrying monoplane of very curious appearance. A wing of very great chord and thickness in the centre is built into the top of a fuselage not unlike that of the "Goliath." This wing tapers very acutely towards the tip—it has a chord of 6 m. (19 ft. 8 in.) at the centre and of only about 3 m. (9 ft. 10 in.) at the tips.

At the bottom of the fuselage there are two short projecting wing roots, carrying at each of their ends a pair of 180 h.p. Hispano-Suiza engines in tandem. From the engine-mountings a pair of diagonal struts runs upward and outward to the main wing, another strut runs upward and inwards to the junction of fuselage and main wing, and below the V of the undercarriage projects downwards.

Side-by-side seating for two pilots is arranged at the top of the fuselage, ahead of the wing. Below this is a luggage compartment and behind the passenger cabin, which has space for twelve seats.

The fuel tanks, of 1,000 litres total capacity, are carried in the wings, above the engines.

The machine was designed and built to satisfy the requirements laid down by the Aero Club of France in the rules for contest for the Grand Prix des Avions de Transport, 1923, and the machine was classed first in that contest, winning a prize of 500,000 francs.

A modified type of F3X fitted with two Lorraine-Dietrich engines of 400 h.p., instead of the four Hispano-Suizas, is projected. the overall dimensions and the loaded weight will be the same, with a slight increase in the disposable load. It is estimated that this machine will have a top speed of 200 km.h. (124 m.p.h.), a landing speed of 100 km.h. (62 m.p.h.) and a ceiling of 4,000 m. (13,120 ft.).

The Farman Touring Monoplane.

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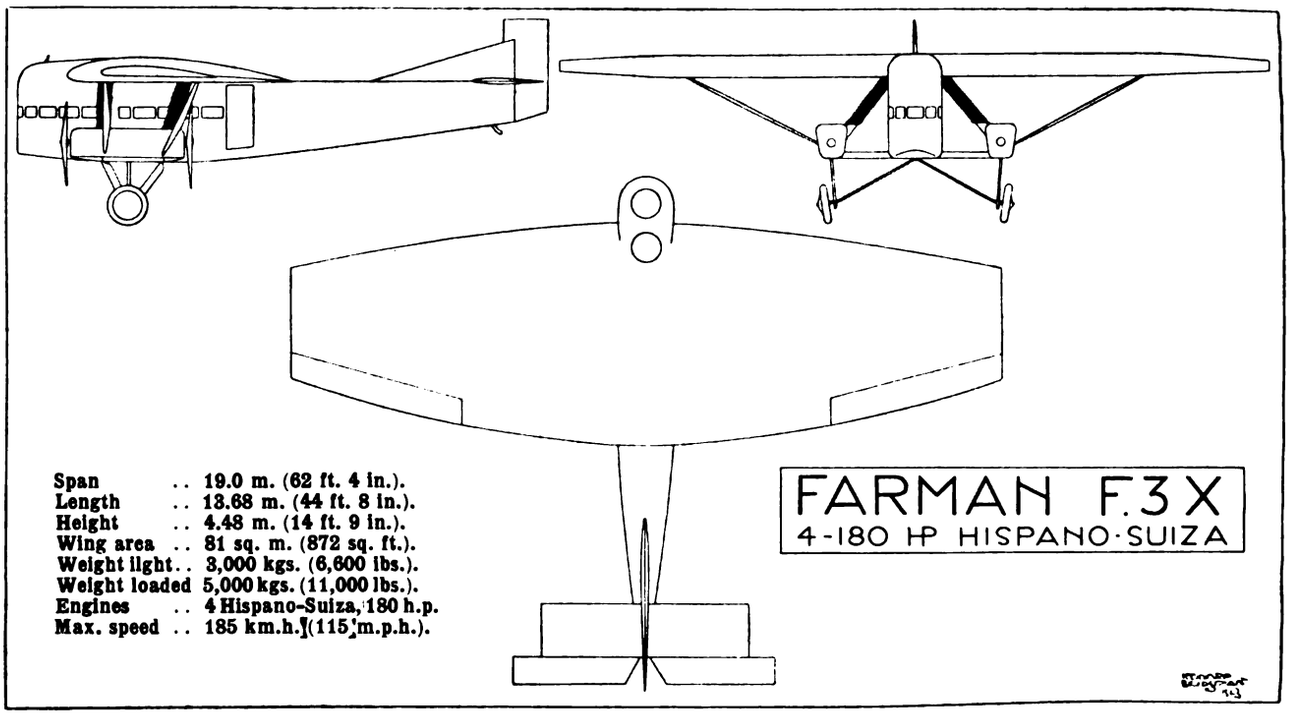
FARMAN—*continued.*



Span	.. 19.0 m. (62 ft. 4 in.).
Length	.. 13.68 m. (44 ft. 8 in.).
Height	.. 4.48 m. (14 ft. 9 in.).
Wing area	.. 81 sq. m. (872 sq. ft.).
Weight light	.. 3,000 kgs. (6,600 lbs.).
Weight loaded	5,000 kgs. (11,000 lbs.).
Engines	.. 4 Hispano-Suiza, 180 h.p.
Max. speed	.. 185 km.h. (115 m.p.h.).

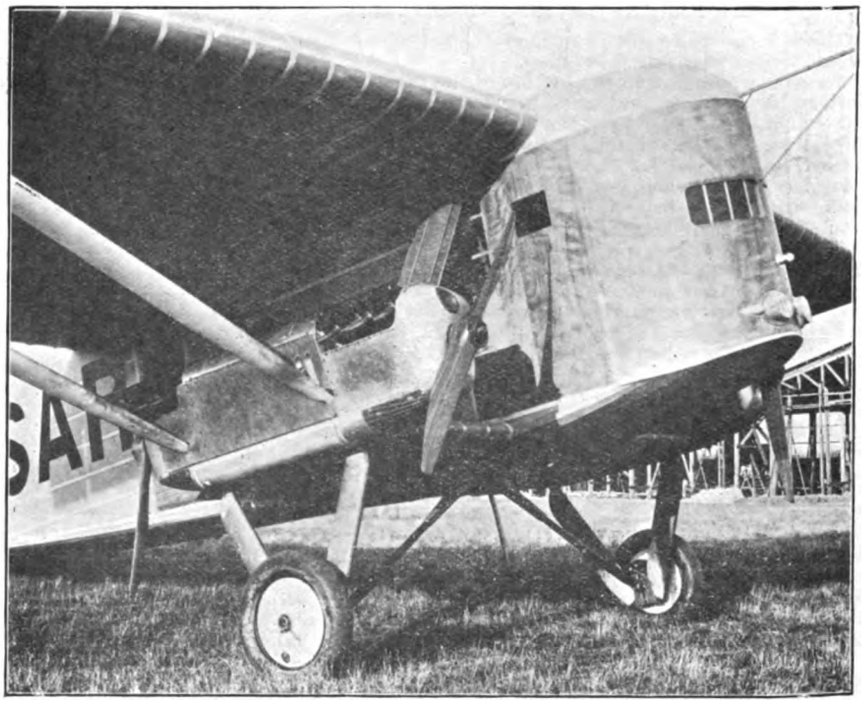
THE FARMAN "MOUSTIQUE."

A light aeroplane built for and winner of the competition organised in the summer of 1923 by the Petit Parisien. The machine is a normal wire-braced monoplane of extremely light construction. It is built with either the 4-cylinder Sergant engine or the 3-cylinder radial Salmson.

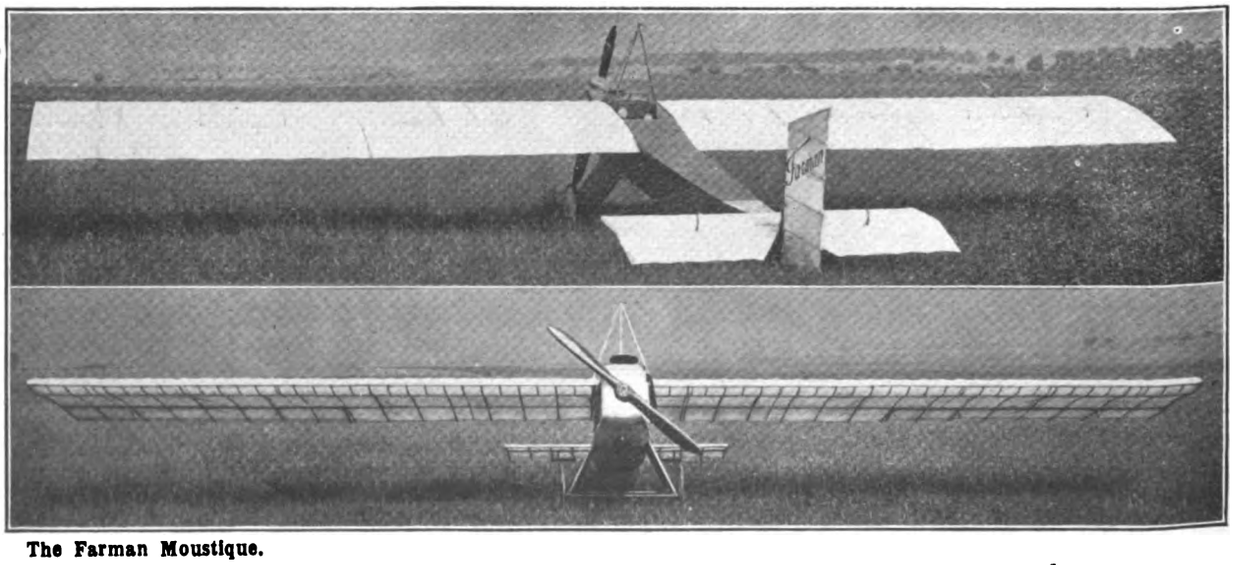
Specification.

Span	.. 10.5 m. (34 ft. 5 in.).
Length	.. 5.665 m. (18 ft. 7 in.).
Height	.. 2.28 m. (7 ft. 6 in.).
Wing area	.. 15 sq. m. (161 sq. ft.).
Weight empty	105 kgs. (231 lbs.).
Weight loaded	195 kgs. (429 lbs.).
Engine	.. Salmson, 16 h.p., 2,400 r.p.m.
Wing loading	13 kgs./sq. m. (2.7 lbs./sq. ft.).
Power loading	12.4 kgs./h.p. (27 lbs./h.p.).
Speed	.. 80 km.h. (50 m.p.h.).
Climb to 500 m. (1,640 ft.)	7 mins.

NOTE.—The machine with Sergant engine is approximately 10 kgs. heavier and has practically the same performance.



The Nose of the Farman F.3X.



The Farman Moustique.

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F.B.A.

Hydravions F.B.A.
Louis Schreck, Quai de Seine, Argenteuil S. & O.

This firm, after an apparently dormant period, re-appeared at the 1921 Paris Salon, and showed the hull and undercarriage of an amphibian machine. The hull was merely a somewhat enlarged edition of the old type F.B.A. hull.

THE F.B.A. TWO-SEATER 16 HE2.

This machine is a small side-by-side two-seater with a 180 h.p. Hispano-Suiza engine. The wing structure is a single bay biplane, with a dihedral on the bottom wing only. The tail is normal—consists of a tail plane and elevator carried half way up a fin built on to the aft end of the hull. The tail of the hull rises fairly steeply to carry the tail surface clear of the water, but the very exaggerated upsweep of this part which was a feature of F.B.As. in the past has disappeared.

The hull is of three-ply secured to timber framings, and is generally rectangular in section—a slight V bottom at the bows washing out to flat well before the step. The step is deep—at least 6 inches.

THE F.B.A. 17H.E.2.

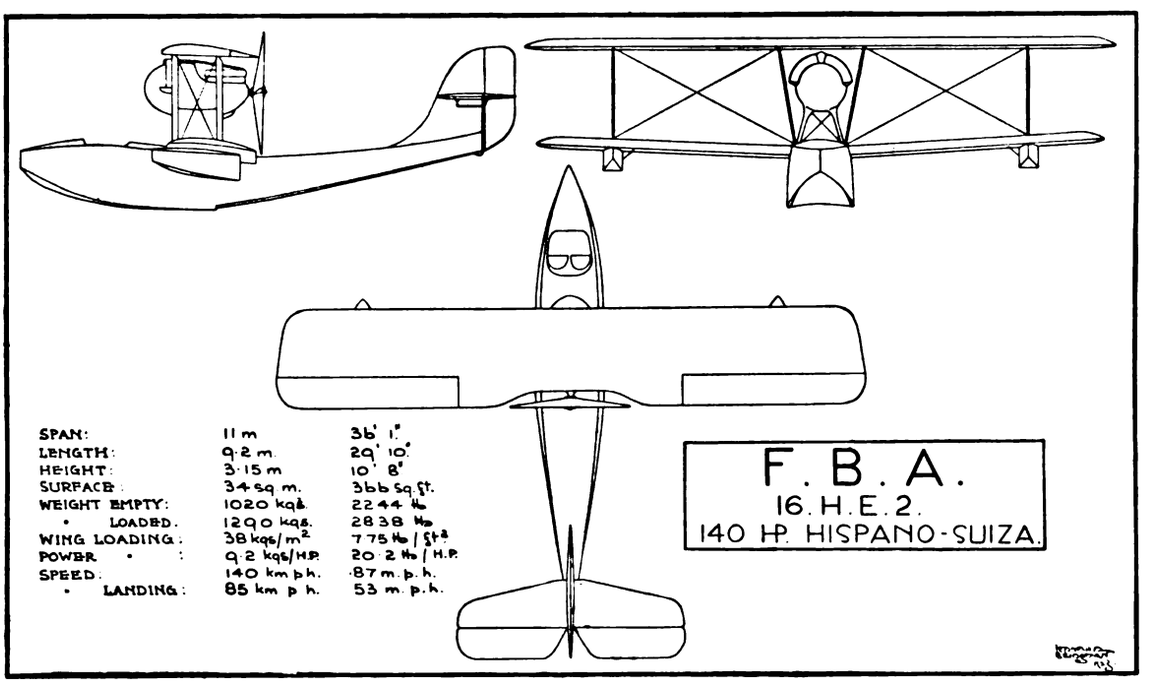
A two or three-seater flying-boat fitted with either the 140 h.p. or the 180 h.p. Hispano-Suiza engine. It is used as a dual-control school machine with the former engine, and as a general utility machine carrying two persons and four hours' fuel, or three persons and two hours' fuel, with the more powerful engine.

It is a single-bay biplane with a three-ply hull. The engine is mounted between the wings and drives a pusher airscrew.

The type 17H.E.2 won the Course Crosière de la Méditerranée in September, 1923, and put up a seaplane height record on December 1st, 1923.

Specification.

Span	**12.87 m. (42 ft. 4 in.).**
Length	**8.94 m. (29 ft. 3 in.).**
Height	**3.2 m. (10 ft. 6 in.).**
Wing area	**36 sq. m. (387 sq. ft.).**
Weight empty	**850 kgs. (1,870 lbs.).**
Weight loaded	**1,150 kgs. (2,530 lbs.).**
Engine	**Hispano-Suiza, 180 h.p.**
Wing loading	**31.5 kgs./sq. m. (6.5 lbs./sq. ft.).**
Power loading	**6.4 kgs./h.p. (14 lbs./h.p.).**
Max. speed	**165 km.h. (102 m.p.h.).**
Landing speed	**80 km.h. (50 m.p.h.).**
Climb to 2,000 m. (6,560 ft.)	**9 m.**
Ceiling	**5,000 m. (16,400 ft.).**


SPAN: 11 m 36' 1"
LENGTH: 9·2 m. 29' 10"
HEIGHT: 3·15 m 10' 8"
SURFACE: 34 sq. m. 366 sq. ft.
WEIGHT EMPTY: 1020 kgs. 2244 lbs.
" LOADED. 1290 kgs. 2838 lbs.
WING LOADING: 38 kgs/m² 7·75 lbs / ft²
POWER " : 9·2 kgs/H.P. 20·2 lbs / H.P.
SPEED: 140 km p h. 87 m. p. h.
" LANDING: 85 km p h. 53 m. p. h.
F. B. A.
16. H. E. 2.
140 HP. HISPANO-SUIZA.

G

GOURDOU ET LESEURRE.

25, Rue Kruger, Parc Saint-Maur, Seine.

M. M. Gourdou and Leseurre were jointly responsible for the design *circa* 1918 of a Monoplane of the Morane "parasol" type, which was illustrated in the 1919 edition of this book. The type has since been developed successfully.

The more recent Gourdou-Lesseurre monoplane is an all-metal parasol monoplane similar in arrangement to their standard 180 h.p. monoplane. It is fitted with a 300 h.p. Hispano-Suiza engine with a Rateau supercharger.

Specification.

Span	**14.5 m. (48 ft.).**
Chord	**2.88 m. (9 ft. 10 in.).**
Length	**9.6 m. (31 ft. 6 in.).**
Surface	**40 sq. m. (430 sq. ft.).**
Surface of tail	**2.31 sq. m. (25 sq. ft.).**
Surface of elevator	**2.31 sq. m. (25 sq. ft.).**
Weight loaded	**1,860 kgs. (4,092 lbs.).**
Useful load	**400 kgs. (880 lbs.).**
Weight of fuel	**310 kgs. (682 lbs.).**
Wing loading	**43.2 kgs./m². (9 lbs./sq. ft.).**
Weight per h.p.	**6.2 kgs. (13.6 lbs.).**
Ceiling	**10,000 m. (32,800 ft.).**
Speed at 5,000 m.	**240 km.p.h. (148 m.p.h.).**

THE GOURDOU-LESEURRE C.1 FIGHTER.

The latest development of the type is again an all-metal "Parasol" monoplane with a retractable undercarriage and a Gnôme-Bristol "Jupiter" engine. The standard machine is a single-seat fighter, but a version fitted with cut-down wings was built for the Coupe Beaumont race, 1923.

The fuselage is of oval section and the engine is carried in a very curious cowling—each cylinder having its own streamline pot over it, with a slot in the front and the rear to admit cooling air.

The wings, which have swept-back leading edges, are mounted on a central steel tube cabane and braced on each side by two duralumin tubes from the bottom of the fuselage.

The undercarriage consists of two streamlined legs, one on each side, which can be folded back into the fuselage by a worm and worm wheel. There is no cross-axle.

The machine is mainly built of duralumin, though wood is employed for the wing ribs.

The racing machine with the small wings, which has already been mentioned, was flown round the 50 km. Beaumont Cup course under official observation by the French Section Technique and averaged 360 km.h. (223 m.p.h.) over the course—the highest speed yet attained under similar conditions outside of America.

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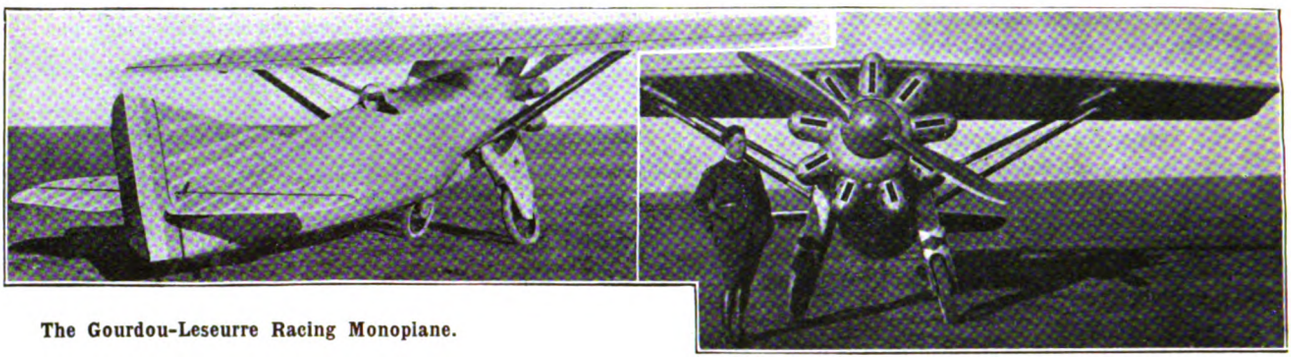
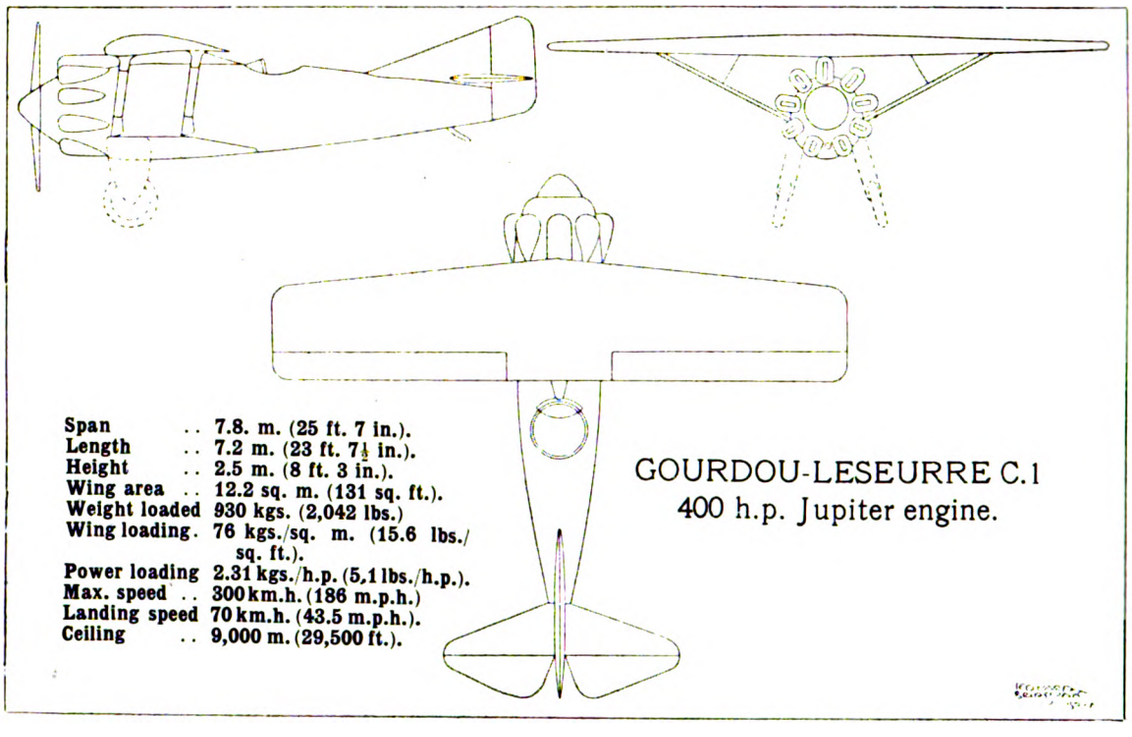
GOURDOU-LESEURRE—*continued.*



The Gourdou-Leseurre Racing Monoplane.


Span .. 7.8. m. (25 ft. 7 in.).
Length .. 7.2 m. (23 ft. 7½ in.).
Height .. 2.5 m. (8 ft. 3 in.).
Wing area .. 12.2 sq. m. (131 sq. ft.).
Weight loaded 930 kgs. (2,042 lbs.)
Wing loading. 76 kgs./sq. m. (15.6 lbs./sq. ft.).
Power loading 2.31 kgs./h.p. (5,1 lbs./h.p.).
Max. speed .. 300 km.h. (186 m.p.h.)
Landing speed 70 km.h. (43.5 m.p.h.).
Ceiling .. 9,000 m. (29,500 ft.).
GOURDOU-LESEURRE C.1
400 h.p. Jupiter engine.

H

HANRIOT.

Hanriot & Cie, 194 Boulevard Bineau, Neuilly-sur-Seine.

Founded during the war by M. Hanriot. who had retired from aviation before the war. Made a number of Sopwith machines for the French Government, and later produced a machine described in the 1919 edition of "All the World's Aircraft."

The H.D.14 is a dual control school machine, fitted with an 80 h.p. Le Rhône. The construction is in wood and is very simple and robust. The planes are made interchangeable and are easily taken down. The four ailerons of metallic construction are all interchangeable. Two separate undercarriages are fitted under each first set of interplane struts, and strongly wire-braced to the fuselage and have a track of 4 metres.

The dual control is original in that the two joy-sticks are interconnected by two tubes, one running inside the other. When the dual control is in operation the two tubes are locked solid by three sliding projections on the outer tube which fit

The Hanriot Training Machine H.D.14.

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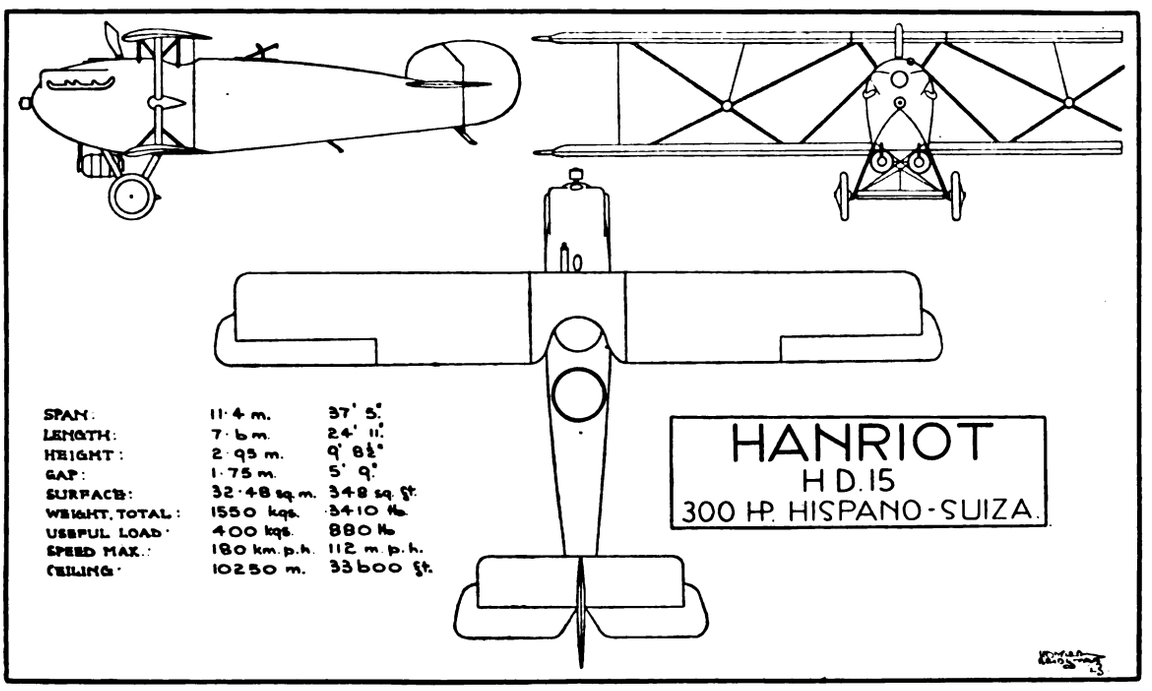
HANRIOT*—*continued.


HANRIOT
H.D.15
300 H.P. HISPANO-SUIZA.
SPAN: 11·4 m. 37' 5"
LENGTH: 7·6 m. 24' 11"
HEIGHT: 2·95 m. 9' 8½"
GAP: 1·75 m. 5' 9"
SURFACE: 32·48 sq.m. 348 sq.ft.
WEIGHT, TOTAL: 1550 kgs. 3410 lbs.
USEFUL LOAD: 400 kgs. 880 lbs.
SPEED MAX.: 180 km.p.h. 112 m.p.h.
CEILING: 10250 m. 33600 ft.

into holes in the inner tube. The projections are controlled from the pilot's seat by Bowden control acting against springs so that a movement of a lever which is fitted with an eccentric it is possible for the pilot to throw the pupil's controls out of action.

The principal particulars are :—Span, 10.4 m. ; length, 7.25 m. ; surface, 34.5 sq. m. ; weight, empty, 516 kgs. ; weight loaded, 710 kgs. ; speed, max., 116 km.p.h. ; landing speed, 52 km.p.h. ; ceiling, 2,000 m.

HANRIOT ALL-METAL MACHINES.

More recently, the Hanriot firm have undertaken the construction of a series of all-metal machines. In these, duralumin is used for covering and for a large part of the wing structure, steel tubes being employed for the fuselage.

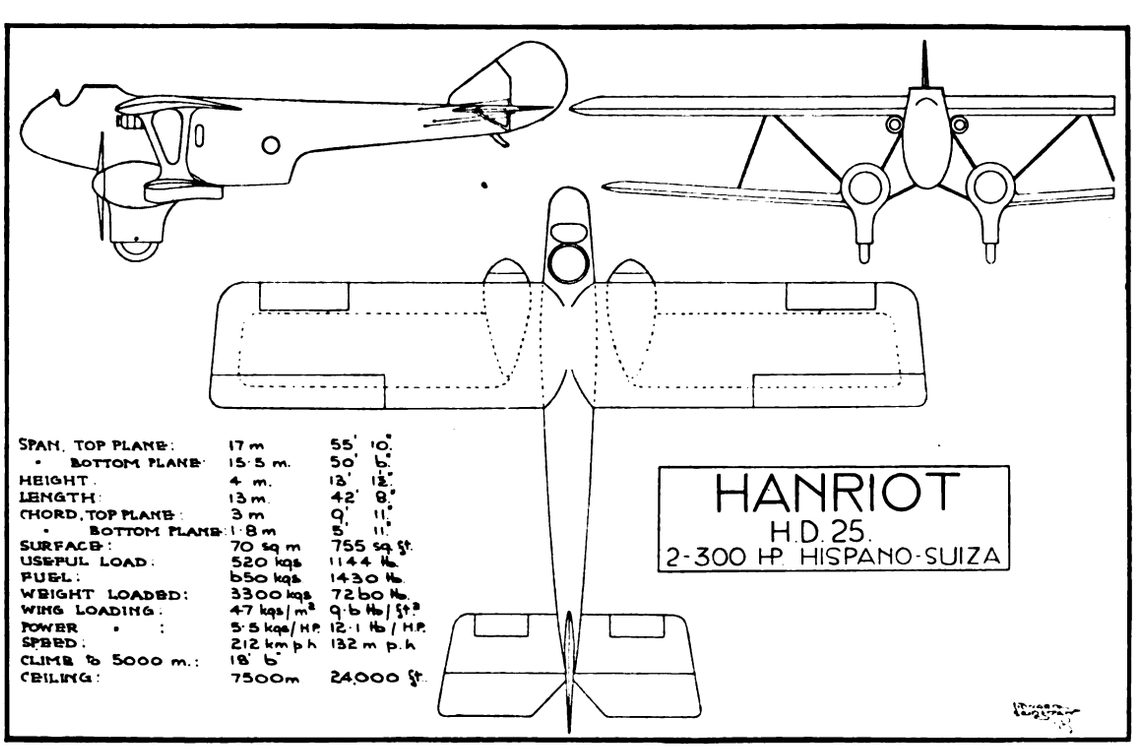
Of these, the H.D.15 a two-seat reconnaissance machine and the H.D.25, a two engine bomber, are shown in scale drawings.

THE HANRIOT H.26 SINGLE-SEAT FIGHTER.

This machine has one little wing fairing the undercarriage axle, one less small suspended half-way up the undercarriage, and one sizeable wing above the fuselage.

The structure is distinctly complicated. The wings, except that on the axle, are semi-elliptic in plan form. They are built each on one large duralumin tube spar of rectangular section, assisted by two circular tubes—one in the nose of the wing and one about half-way between the box spar and the trailing edge. The ribs are lattice girders built of duralumin channel section of about 6 by 6 mm. section fastened together by 1¼mm. bolts and nuts. The ribs are fastened to the spars by about 3 mm. setscrews.

The fuselage is of the usual wire-braced rectangular type with longerons and struts of duralumin channels of about 25 mm. side and 1½ mm. thick. Outside this main structure there is a subsidiary fairing built up of formers and laths made from the same size channels as are used for ribs.


HANRIOT
H.D.25.
2-300 H.P. HISPANO-SUIZA
SPAN. TOP PLANE: 17 m 55' 10"
" BOTTOM PLANE: 15·5 m. 50' 6"
HEIGHT: 4 m. 13' 1½"
LENGTH: 13 m. 42' 8"
CHORD, TOP PLANE: 3 m 9' 11"
" BOTTOM PLANE: 1·8 m 5' 11"
SURFACE: 70 sq m 755 sq ft.
USEFUL LOAD: 520 kgs 1144 lbs.
FUEL: 650 kgs 1430 lbs.
WEIGHT LOADED: 3300 kgs 7260 lbs.
WING LOADING: 47 kgs/m² 9·6 lbs/ft²
POWER " : 5·5 kgs/H.P. 12·1 lbs/H.P.
SPEED: 212 km p h 132 m p.h
CLIMB to 5000 m.: 18' 6"
CEILING: 7500m 24,000 ft.

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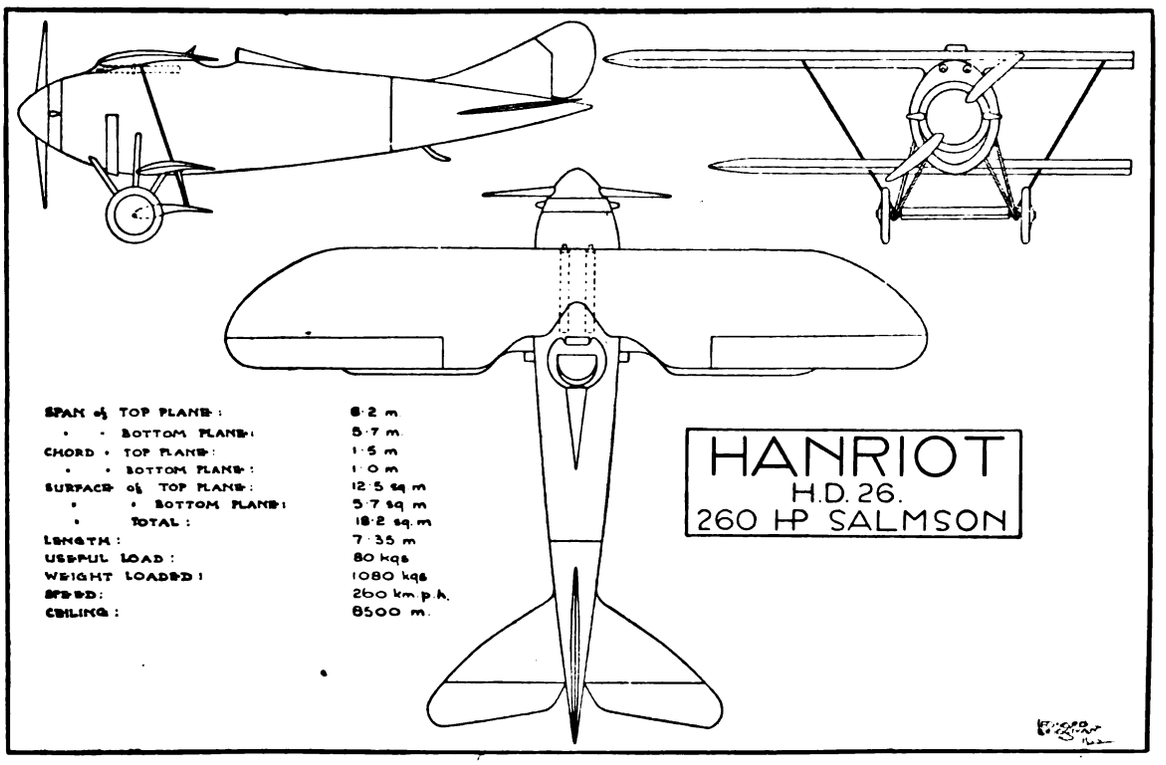
HANRIOT*—*continued.

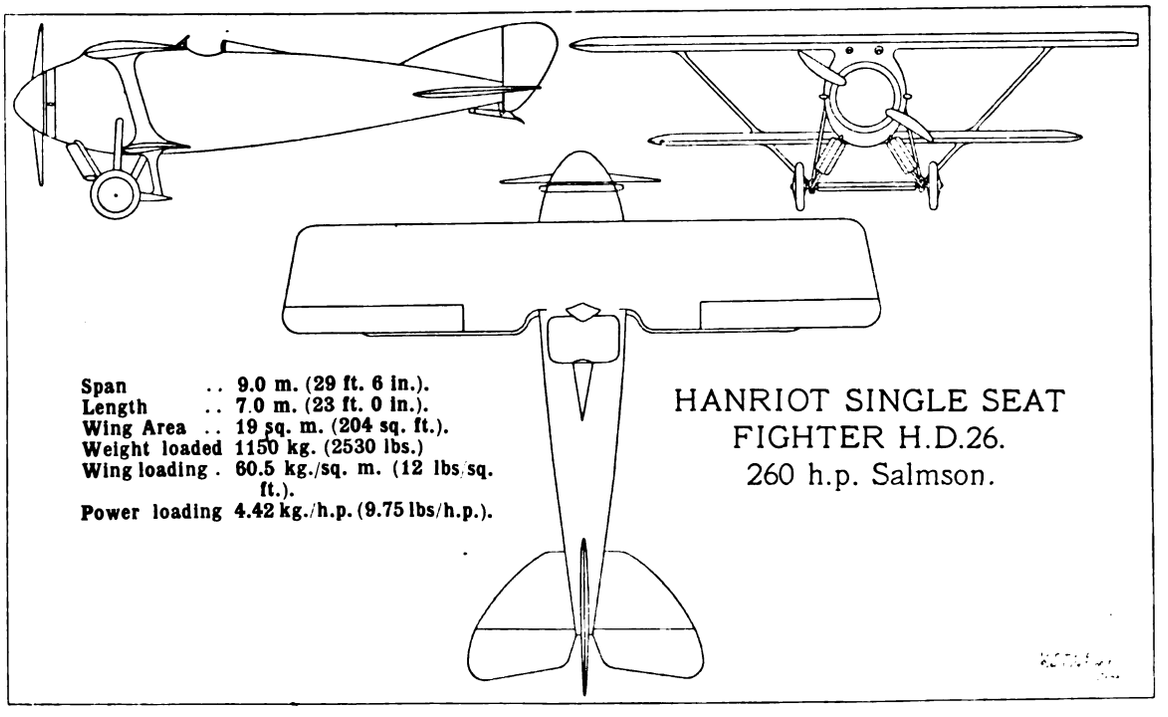

SPAN of TOP PLANE : 8·2 m.
" " BOTTOM PLANE : 5·7 m.
CHORD " TOP PLANE : 1·5 m.
" " BOTTOM PLANE : 1·0 m.
SURFACE of TOP PLANE : 12·5 sq m.
" " BOTTOM PLANE : 5·7 sq m.
" TOTAL : 18·2 sq. m.
LENGTH : 7·35 m.
USEFUL LOAD : 80 kgs.
WEIGHT LOADED : 1080 kgs.
SPEED : 260 km. p.h.
CEILING : 8500 m.
HANRIOT
H.D. 26.
260 HP SALMSON

The wings are braced by one set of lift wires on each side, which runs from a rear extension of the undercarriage to about half-way along the span of the upper wing. Landing loads are taken by the spars without exterior assistance.

A general arrangement drawing, with specification, gives the essential characteristics of this machine.

A modified version of the H.D.26 has recently been produced free from some of the eccentricities of the original design. The wings are now braced by rigid struts running up from the undercarriage in place of the single lift wire. The plan form of the wings has also been modified.

A general arrangement drawing below shows the new type.


Span .. 9.0 m. (29 ft. 6 in.).
Length .. 7.0 m. (23 ft. 0 in.).
Wing Area .. 19 sq. m. (204 sq. ft.).
Weight loaded 1150 kg. (2530 lbs.)
Wing loading . 60.5 kg./sq. m. (12 lbs./sq. ft.).
Power loading 4.42 kg./h.p. (9.75 lbs/h.p.).
HANRIOT SINGLE SEAT
FIGHTER H.D.26.
260 h.p. Salmson.

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L

LATÉCOÈRE.

Forges et Ateliers de Construction Latécoère, Boulevarde Haussmann 182, Paris. Works at Toulouse, Montaudran and Baynères de Bigorre.

The Latécoère firm, which is directly interested in the operation of the Toulouse, Rabat and Casablanca Air Service, has devoted much time and money to the production of a series of ambitious designs, intended both for commercial and for war purposes.

THE L.A.T.4.

This machine is a three-engined passenger carrier intended to accommodate a total of twenty persons. The fuselage is of very large dimensions, largely constructed of three-ply, and very luxurious in regard to upholstering. The pilot and mechanics are accommodated with a sort of hump on the front end, which completely encloses them, their view being entirely through windows. Ahead of the cabin is mounted one Salmson engine. The wing structure is an equal span biplane, with a dihedral on the bottom wing only. There are only three interplane struts a side, the inner bay of the wings having the usual fore and aft struts, and the outer bay only one single strut.

Two side engines are carried in nacelles, supported directly from the fuselage by a triangulated outrigger, and by a strut running down the wings. The undercarriage consists of a pair of Vees under each engine, carrying a pair of side-by-side wheels. These wheels are carried by an axle which runs up to a pylon projecting from beneath the fuselage, and is hinged there. The shock absorbers are attached to the top of the Vees and are entirely within the wings.

The tail unit is very complex. There is a tail plane and elevator carried at the lower edge of the fuselage and braced by a steel tube running forward and downward from the rear spar. A second tail plane, of equal size, is supported on the central fixed fin rising from the fuselage and this is again braced by a steel tube from the back spar to the top of the fuselage. The central fin is followed by a rudder, and in addition there are two hinged vertical surfaces fixed, one at each side, to the two tail planes. These, it is gathered, are to be used when flying with one wing engine out of commission, and are not used for steering in the usual way. The bracing of this tail, which could easily have been made of the normal biplane type, actually depends on the two independent bracings, which run forward at a very flat angle indeed.

The machine is in every respect ingenious, but fails to be convincing. The first example crashed on test. A more recent three-engine machine of similar type was flown without untoward incident early in 1924.

Such data as are available are given in the specification.

Specification of the L.A.T.4.

Span	**24.66 m. (81 ft.).**
Length	**14.53 m. (47 ft. 9 in.).**
Wing area	**140 sq. m. (1,500 sq. ft.).**
Useful load	**2,000 kgs. (4,400 lbs.).**
Power	**1,000 h.p.**
Radius	**1,000 km. (620 miles).**
Speed	**200 km.h. (124 m.p.h.).**

THE L.A.T.5.

This machine appears to be a derivative of the L.A.T.4, which it resembles closely in general arrangement and in many details. It is intended as a bomber and is fitted with three Lorraine-Dietrich engines of 400 h.p. each.

Specification.

Span	**26.68 m. (87 ft. 6 in.).**
Length	**18.10 m. (59 ft. 4 in.).**
Height	**6.25 m. (20 ft. 6 in.).**
Wing area	**195 sq. m. (2,100 sq. ft.)**
Weight empty	**5,000 kgs. (11,000 lbs.).**
Weight of fuel	**1,200 kgs. (2,640 lbs.).**
Useful load	**1,600 kgs. (3,520 lbs.).**
Crew and equipment	**600 kgs. (1,320 lbs.).**
Loaded weight	**8,400 kgs. (18,480 lbs.).**
Wing loading	**43 kgs./sq. m. (8.8 lbs./sq. ft.).**
Power loading	**7 kgs./h.p. (15.4 lbs./h.p.).**
Estimated performance.	
Max. speed	160 km. h. (100 m.p.h.).
Landing speed	88 km.h. (54 m.p.h.).
Ceiling	4,000 m. (13,120 ft.).
Radius of action	700 km. (435 m.).

THE L.A.T.6.

This machine, which is intended for bombing purposes, and built for the French Government, is one of the most extraordinary pieces of metal construction yet seen.

The fuselage, consists of a sort of basket-work tube, built up of short lengths of channel section girders. These short lengths meet at six-way junctions, which consist each of a duralumin disc, about 3 inches diameter, to which each of the converging girders is riveted. There is apparently only one rivet to each end of each channel—this being of roughly 2 mm. diameter—and the position of the rivets in the channels appears to have been left to chance. Some of them look to have missed the channel entirely.

This basket-work is held in shape by a series of bulkheads, built up of sheet metal, and is finally to be covered by a complete sheathing of about 20 gauge thickness. Doubtless by the time the skin is attached by innumerable rivets the structure will be amply strong, but it would be just as strong if the internal basket were decently fastened together and the whole were then covered with fabric.

Dimensions, etc., will be found on a general arrangement drawing overleaf. To these the following performance estimate should be added.

Estimated performance.	
Max. speed	180 km.h. (112 m.p.h.).
Min. speed	85 km.h. (53 m.p.h.).
Ceiling	5,500 m. (18,000 ft.).

The L.A.T. 6. (four 230 h.p. Salmson engines.)

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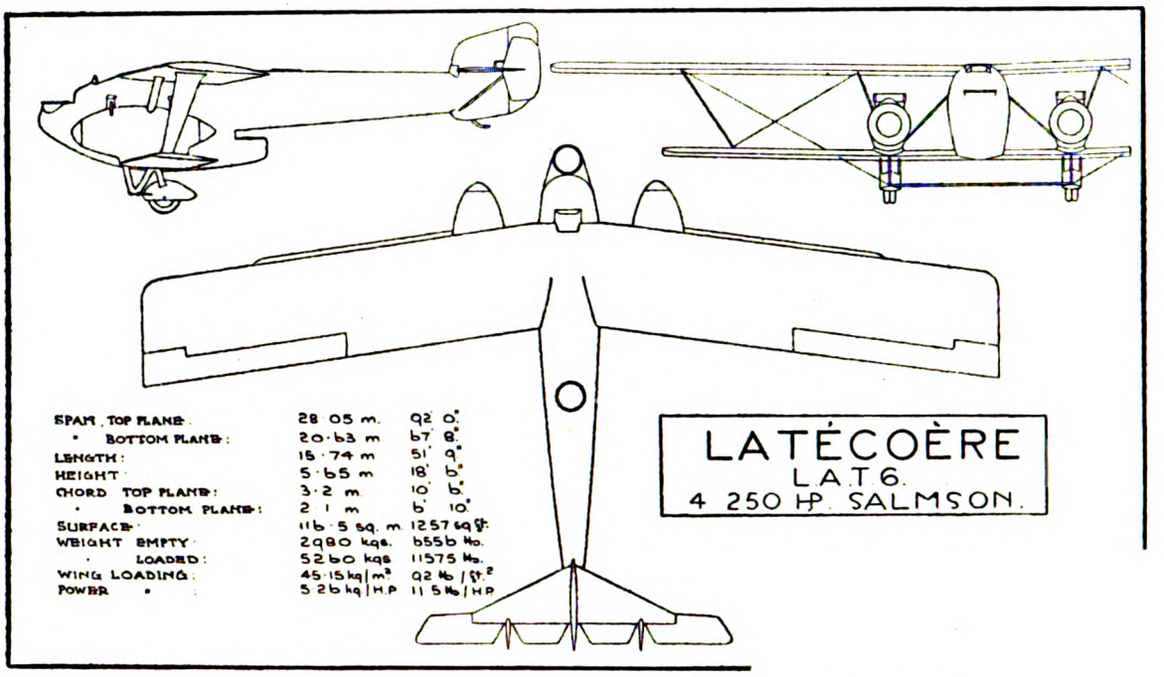
LATÉCOÈRE—*continued.*


SPAN, TOP PLANE: 28·05 m. 92' 0"
BOTTOM PLANE: 20·63 m 67' 8"
LENGTH: 15·74 m 51' 9"
HEIGHT 5·55 m 18' 6"
CHORD TOP PLANE: 3·2 m 10' 6"
BOTTOM PLANE: 2·1 m 6' 10"
SURFACE 116·5 sq. m 1257 sq ft
WEIGHT EMPTY 2980 kgs. 6556 lbs.
LOADED: 5260 kgs 11575 lbs.
WING LOADING 45·15 kg/m² 92 lbs/ft²
POWER 5·26 kg/H.P 11·5 lbs/H.P
LATÉCOÈRE
LAT 6.
4 250 HP. SALMSON.

THE L.A.T.7.

A three-engined all-metal monoplane for military purposes, now being designed. No particulars beyond those of the specification are available.

Specification of the L.A.T.7.

Span	**26.64 m. (87 ft. 6 in.).**
Wing area	**103 sq. m. (1,150 sq. ft.).**
Weight loaded	**4,645 kgs. (10,200 lbs.).**
Engines	**3 Renault, 300 h.p. each.**
Wing loading	**45 kgs./sq. m. (8.8 lbs./ sq. ft.).**
Power loading	**5.2 kgs./h.p. (11.3 lbs./ h.p.).**
Estimated performance.	
Max. speed	212 km.h. (131 m.p.h.).

THE L.A.T.8.

This machine is a normal single-engined passenger carrier, with cabin for five passengers. It is believed to be in service on the Latécoère Morroccan Service. The only available data are given below.

Specification of the L.A.T.8.

Span	**13.2 m. (43 ft. 5 in.).**
Wing area	**50 sq. m. (538 sq. ft.)**
Engine	**Renault, 300 h.p.**
Weight loaded	**2,200 kgs. (4,840 lbs.).**
Wing loading	**44 kgs./sq. m. (9 lbs./ sq. ft.).**
Power loading	**7.3 kgs./h.p. (16 lbs./h.p.).**
Max. speed	**180 km.h. (112 m.p.h.).**

A single-engine monoplane with 400 h.p. Lorraine Dietrich engine, known as the L.A.T.16, was completed and flown early in 1924.

LATHAM.

Latham & Cie, Société Industrielle de Caudebec, Caudebec-en-Caux (Seine Interieure).

M. Jean Latham is a cousin of the famous Antoinette pilot. This factory built flying-boats during the War, and continues this branch of work.

The firm produce the types of flying-boat here illustrated and described.

THE LATHAM SINGLE-ENGINED BOAT.

A single-engined biplane boat, characterized by a somewhat slender tail to the hull, and the use of three steps close together. No details of construction are available.

Specification.

Span	**14.5 m. (47 ft. 7 in.).**
Length	**12.0 m. (39 ft. 5 in.).**
Height	**4.1 m. (13 ft. 6 in.).**
Wing area	**60 sq. m. (644 sq. ft.).**
Weight empty	**1,450 kgs. (3,190 lbs.).**
Weight loaded	**2,150 kgs. (4,730 lbs.).**
Weight of fuel and oil	**230 kgs. (506 lbs.).**
Engine	**Renault, 300 h.p.**
Wing loading	**36 kgs./sq. m. (7.4 lbs./sq. ft.).**
Power loading	**7.16 kgs./h.p. (15.75 lbs./ h.p.).**
Minimum speed	**80 km.h. (50 m.p.h.).**
Max. speed	**160 km.h. (100 m.p.h.).**
Climb to 2,000 m. (6,560 ft.)	**18 mins.**

The 4-engined Latham flying boat.

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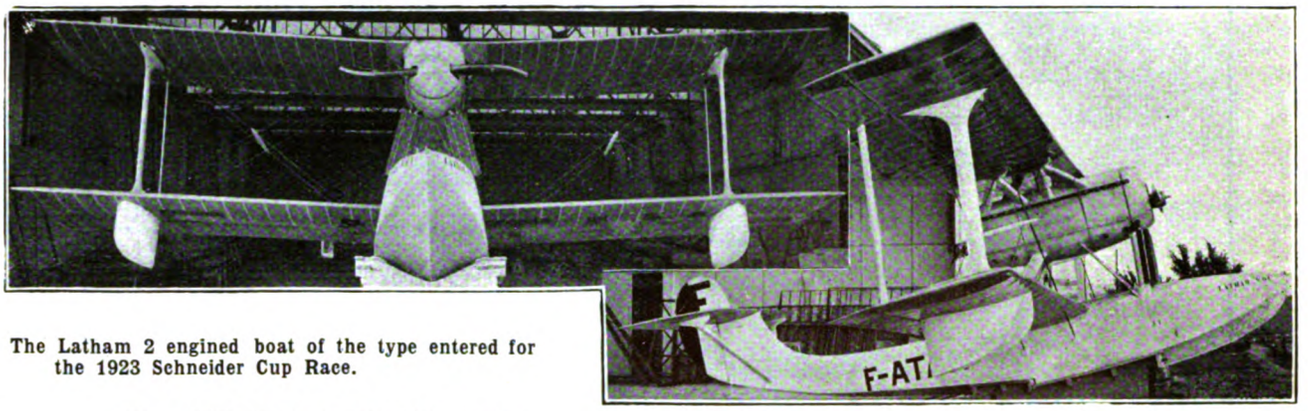
LATHAM—*continued.*



The Latham 2 engined boat of the type entered for the 1923 Schneider Cup Race.

THE LATHAM FOUR-ENGINED BOAT.

A large machine designed for commercial work, fitted with four Salmson engines, each of 250 h.p., arranged in two tandem pairs on each side between wings.

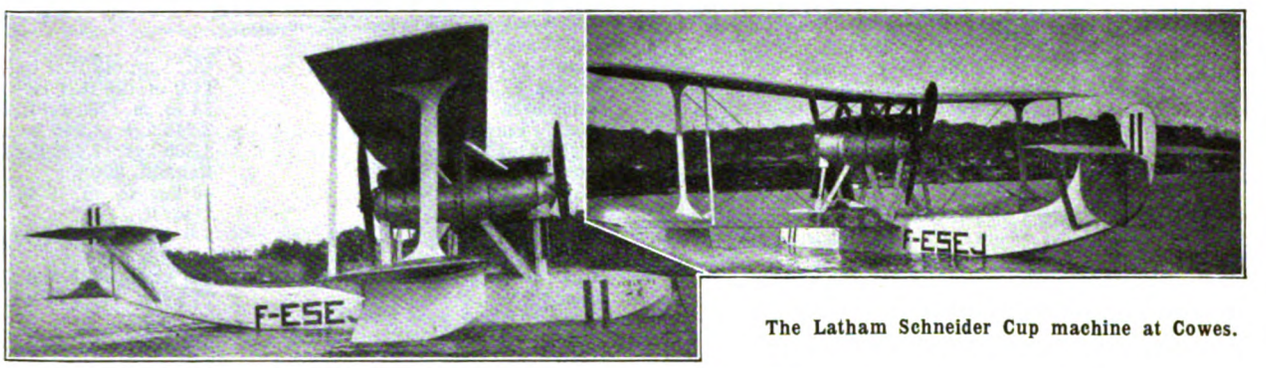
Like the smaller boat, the hull is fitted with three steps.

Specification.

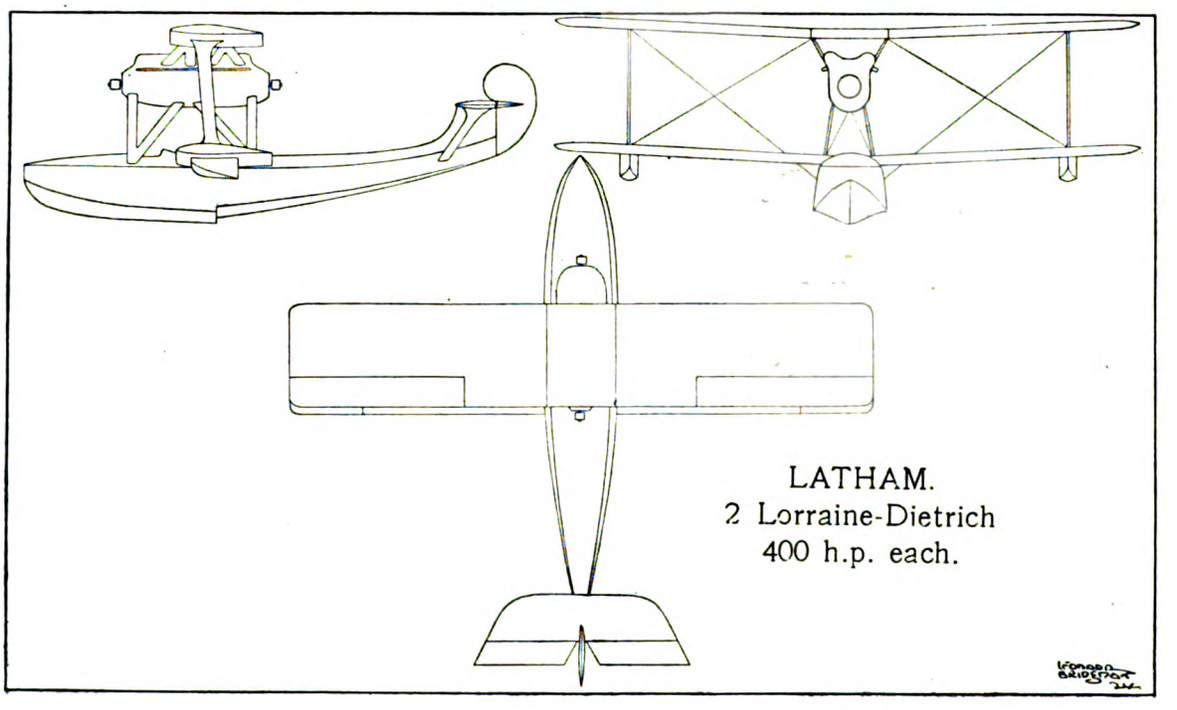
Span	**32 m. (105 ft.).**
Length	**18.2 m. (59 ft. 7 in.).**
Height	**6 m. (19 ft. 3 in.).**
Wing area	**180 sq. m. (1,940 sq. ft.).**
Weight empty	**4,700 kgs. (10,340 lbs.).**
Weight loaded	**7,200 kgs. (15,840 lbs.).**
Useful load	**1,230 kgs. (2,706 lbs.).**
Fuel and oil	**1,270 kgs. (2,794 lbs.).**
Engines	**4 Salmson, 250 h.p. each.**
Wing loading	**40 kgs./sq. m. (8.2 lbs./sq. ft.).**
Power loading	**7.2 kgs./h.p. (15.8 lbs./ h.p.).**
Min. speed	**85 km.h. (53 m.p.h.).**
Max. speed	**164 km.h. (102 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**8 mins.**

THE TWIN TANDEM LATHAM.

One of the French entries for the Schneider Cup Race of 1923 was the twin tandem engine flying boat shown in the photograph and general arrangement drawing here reproduced. The machine which is of a type designed for work with the French Navy was regarded by the French as their main hope in the event of really heavy weather during the navigability trials or the race itself, and it justified their faith in its sea and air-worthiness by flying to Cowes in a gale of great severity. Unfortunately, it did not take part in the race as failure of the starting gear for one engine prevented its arrival at the starting line.



The Latham Schneider Cup machine at Cowes.



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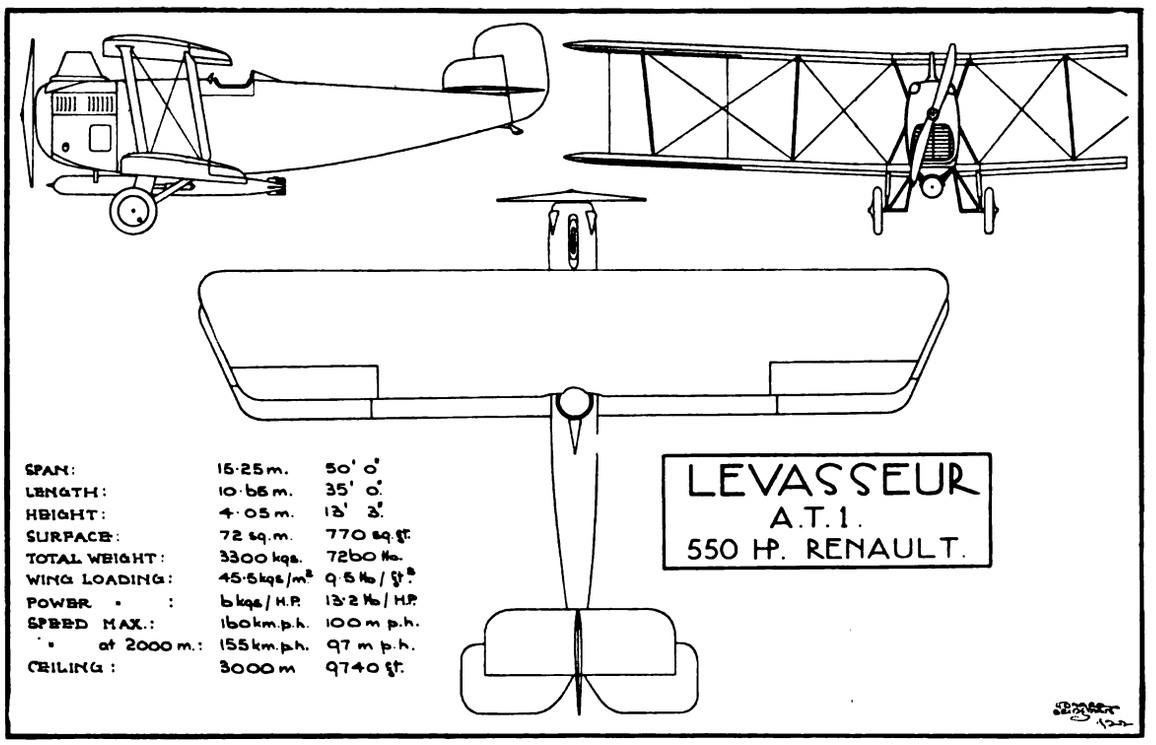
LEVASSEUR.


LEVASSEUR
A.T.1.
550 HP. RENAULT.
SPAN: 15·25 m. 50' 0"
LENGTH: 10·65 m. 35' 0"
HEIGHT: 4·05 m. 13' 3"
SURFACE: 72 sq.m. 770 sq.ft.
TOTAL WEIGHT: 3300 kgs. 7260 lbs.
WING LOADING: 45·6 kgs/m² 9·5 lbs/ft²
POWER : 6 kgs/H.P. 13·2 lbs/H.P.
SPEED MAX.: 180 km.p.h. 100 m.p.h.
at 2000 m.: 155 km.p.h. 97 m.p.h.
CEILING: 3000 m 9740 ft.

P. Levasseur, 17/21, Place Félix Faure, Paris.

THE LEVASSEUR TORPEDO CARRIER A.T.1.

A single-engined torpedo carrier, greatly resembling the Blackburn "Swift" (see British Section). The general characteristics of the "Swift," the construction of the centre section, with its attached-portion of fuselage, as one unit, and the attachment thereto of an engine mounting, and of the tail portion of the fuselage are retained. The construction of the after-part of the fuselage, of the undercarriage, and of the wings is in detail almost exactly as in the British machine.

The engine mounting is modified to take the 600 h.p. Renault engine, the span is slightly decreased, and the slight sweepback of the wings in the original is not retained in this machine.

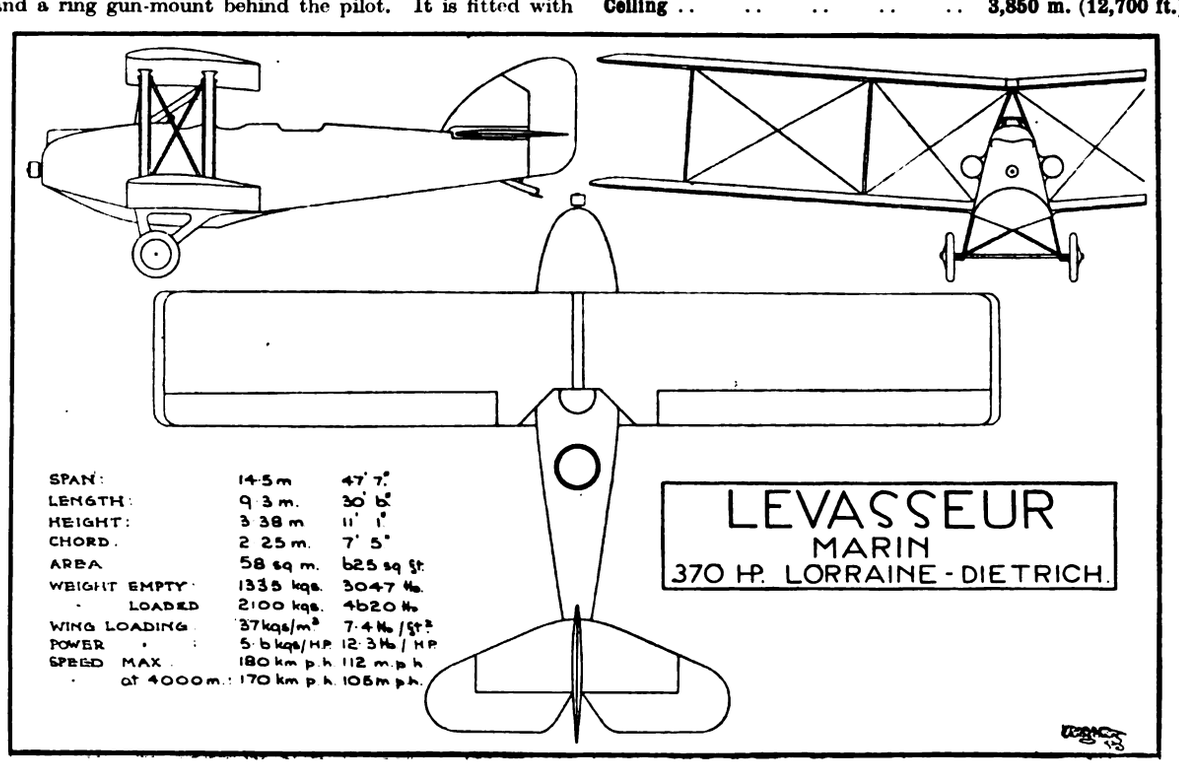
Owing largely to the different engine, the curious bent back of the fuselage line disappears. The specification here published gives the main features of this machine.

THE LEVASSEUR 2A.T.2.

This is a modified version of the A.T.1 fitted with a gunner's seat and a ring gun-mount behind the pilot. It is fitted with the 600 h.p. Renault, and is intended to carry either a 450 m/m. (18 in.) torpedo weighing 700 kgs. (1,540 lbs.) or a 410 kgs. (900 lbs.) bomb. The general design is practically identical with that of the A.T.1.

Specification.

Span	**15.15 m. (49 ft. 7 in.).**
Length	**11.0 m. (34 ft. 1 in.).**
Wing area	**73 sq. m. (785 sq. ft.).**
Weight empty	**2,240 kgs. (4,940 lbs.).**
Weight loaded	**3,365 kgs. (7,420 lbs.).**
Engine	**Renault, 600 h.p.**
Wing loading	**46 kgs./sq. m. (9.45 lbs./sq. ft.).**
Power loading	**5.6 kgs./h.p. (12.4 lbs./h.p.).**
Max. speed at 1,000 m. (3,280 ft.)	**167 km.h. (104 m.p.h.).**
Min. speed	**75 km.h. (45.6 m.p.h.).**
Climb to 3,000 m. (9,840 ft.)	**35½ mins.**
Ceiling	**3,850 m. (12,700 ft.).**


LEVASSEUR
MARIN
370 HP. LORRAINE-DIETRICH.
SPAN: 14·5 m 47' 7"
LENGTH: 9·3 m. 30' 6"
HEIGHT: 3·38 m 11' 1"
CHORD. 2·25 m. 7' 5"
AREA 58 sq m. 625 sq ft
WEIGHT EMPTY 1335 kgs. 3047 lbs.
LOADED 2100 kgs. 4620 lbs.
WING LOADING 37 kgs/m² 7·4 lbs/ft²
POWER : 5·6 kgs/HP 12·3 lbs/HP
SPEED MAX. 180 km p.h 112 m.p.h
at 4000 m.: 170 km p.h 105 m.p.h.

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LEVASSEUR—*continued.*

THE LEVASSEUR "MARIN" THREE-SEATER.

This machine is a development of the type of construction used in the interesting little three-seater described in last year's issue. It is intended for naval reconnaissance.

The fuselage is in three sections. The front section is a steel tube cantilever carrying the engine—a 370 h.p. Lorraine. The central section, which includes the undercarriage, consists of two large panels of multiply wood, carved out to shape. These panels "tumble home" from the full width of the undercarriage at such an angle that they would nearly meet at the level of the upper plane, and they are separated by the axle and by four large diameter steel tubes—two at the bottom and two at the top of the fuselage properly so called.

The after end of the fuselage consists of two side panels of carved out multiply, separated top and bottom by three-ply reinforced with light stiffeners of spruce. It is understood that the whole fuselage is to be three-ply covered, and made watertight to give buoyancy and to allow the machine to alight on the water, though no provision is made for getting off. There does not however appear to be any arrangement to secure that the machine shall not turn over on its wheels when striking the water.

Apart from the fuselage construction, the machine is a perfectly normal unstaggered, two bay biplane—quite well made, —but possessing no very striking features.

LÉVY.

All rights in the flying boat business of Georges Lévy are now the property of Farman Fréres.

LIORÉ ET OLIVIER.

Lioré et Olivier, Rue de Villers 46, Levallois-Perret.

The history of this firm is unknown, their first public appearance being at the Paris Aero Show, in December, 1919, where they showed a large flying-boat, said to be destined for passenger and mail work in the Mediterranean, and described in the 1920 edition of this annual. Nothing has since been heard of the type.

The firm is nevertheless still active and has in production for the French Government the all-metal bomber described below. It also built and exhibited at the Paris Show of 1921 the racing monoplane LeO9, to the designs of M. Margoulis.

THE LeO7.

A twin-engined armed bomber, of all-metal construction. The wings are in the form of a staggered biplane, with a considerable overhang on the top plane. Engines are carried in the usual wing nacelles, and one single-wheeled undercarriage is fitted below each engine. The two undercarriages are tied together by a subsidiary lifting surface. These wheels are encased in domed mudguards with side shields, and are carried in forks which slide in vertical guides within the mudguards.

THE LeO8. (C.A.N.2.)

An all-duralumin braced monoplane for night fighting and reconnaissance

The wing consists of a centre section carried on a central cabane and two extensions supported on adjustable struts of streamlined duralumin tubes. There are two such struts aside. The inner ones spring from the base of the fuselage, the outer ones from the undercarriage. The wing spars are of duralumin, in box form, with tubular drag struts of the same material.

The fuselage is rectangular, built on four square section tubes of duralumin. The after part is braced with tube struts and piano wire. The fore portion has no wire bracing and is covered in sheet aluminium or duralumin.

The undercarriage consists of four struts, nearly vertical in side elevation. Front and back pairs of these struts carry cross members, and between these cross members at each of their outer extremities, is a longitudinal. The two cross members serve as front and rear spars for a wing section surface, and inside this winglet is an axle, rubber sprung to the two outer fore and aft members and carrying at each end a wheel.

The engine is carried on duralumin bearers insulated from the fuselage framing by some shock-absorbing intermediary.

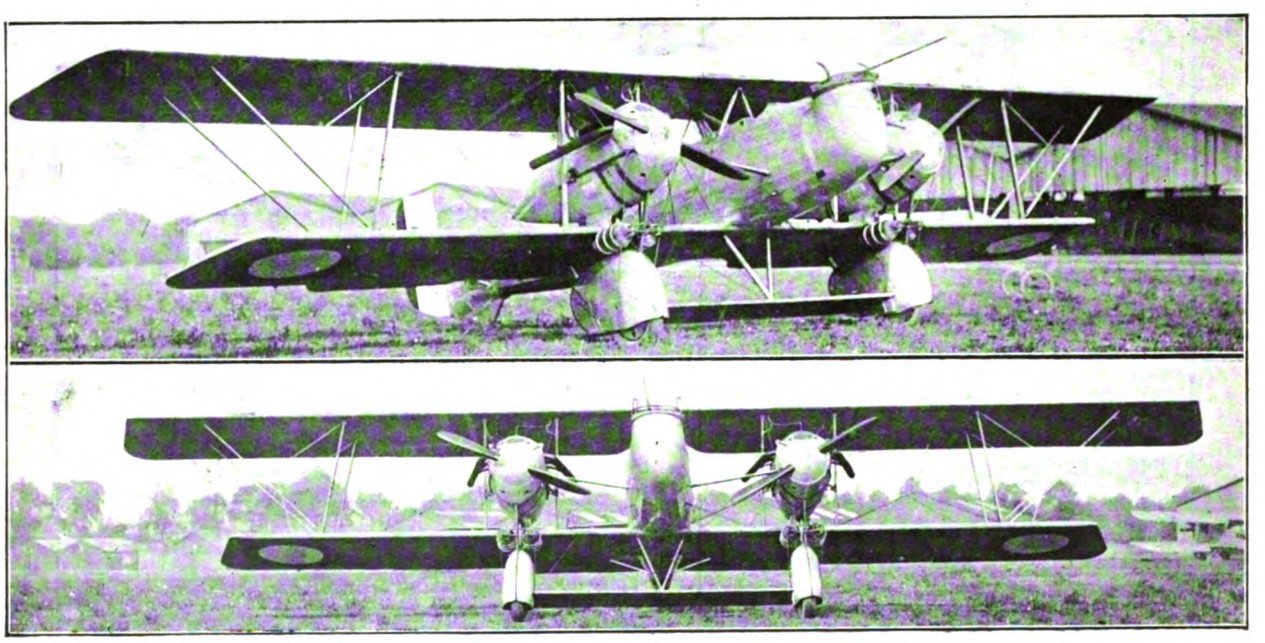
Pilot and passenger are in tandem, pilot ahead, both behind the wing. The machine is fitted with two fixed guns forward, one firing ahead horizontally and one firing downwards, and twin guns on a ring mounting in the observer's seat.

THE LIORÉ ET OLIVIER FLYING BOAT. TYPE LeO.H.13.

This is a twin-engine boat-seaplane of quite normal design. The hull, which is boat-built, is of nearly rectangular section, with a Vee bottom at the bows which however washes out towards the step. In the fore end of the hull a cabin for four passengers is arranged. This cabin gives quite fair room when the passengers are seated, but lacks head room. The pilot's seat is right aft the wings. The wings are of normal biplane type, equal in span top and bottom and without stagger. The engines—two 150 h.p. Hispano-Suizas—are carried between sets of V struts which carry the upper centre section. Outside of these there is one row of struts only. The wing bracing is of streamline wires. The wings are of the Joukowski type of profile which has recently become so popular in France and look to be very closely of the Göttingen 430 section.

The tail is of normal design, and consists of a fin built up as part of the hull, carrying a monoplane tail plane and elevators and a balanced rudder.

This machine is illustrated on the following page.



The LeO7 Twin Hispano Bomber.

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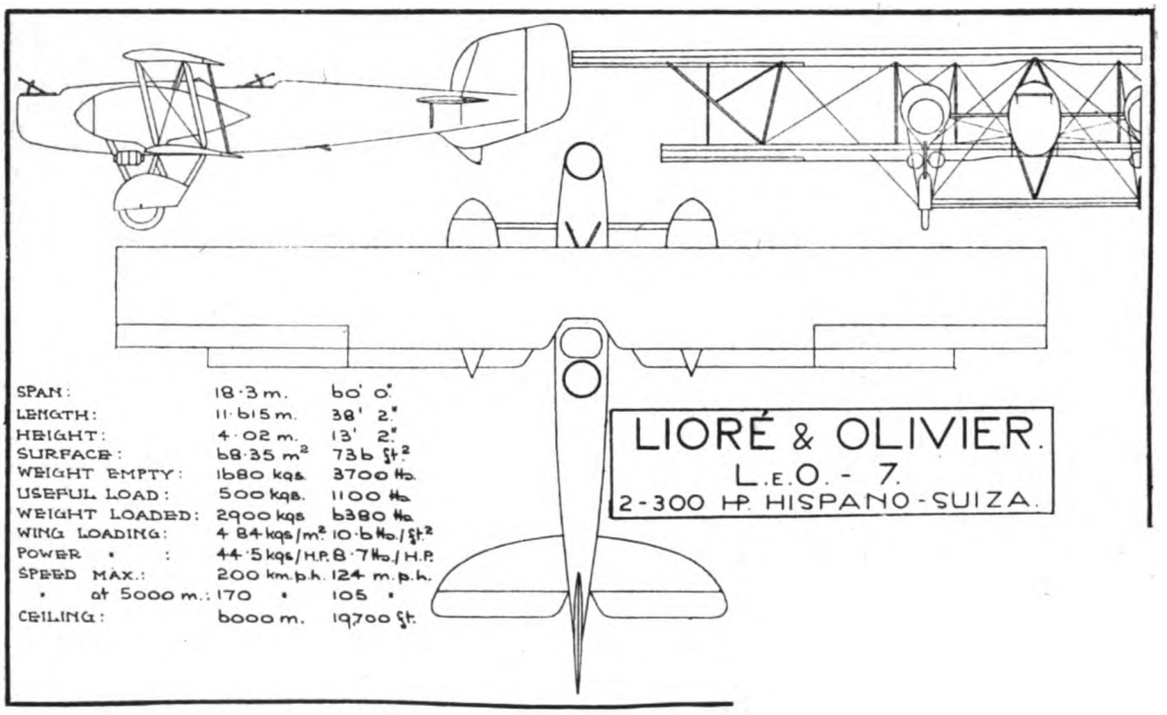
LIORÉ & OLIVIER—continued.


LIORÉ & OLIVIER.
L.E.O. - 7.
2-300 HP. HISPANO-SUIZA.
SPAN: 18·3 m. 60' 0"
LENGTH: 11·615 m. 38' 2"
HEIGHT: 4·02 m. 13' 2"
SURFACE: 58·35 m² 736 ft²
WEIGHT EMPTY: 1680 kgs. 3700 lbs.
USEFUL LOAD: 500 kgs. 1100 lbs.
WEIGHT LOADED: 2900 kgs 6380 lbs.
WING LOADING: 4·84 kgs/m² 10·6 lbs/ft²
POWER " : 44·5 kgs/H.P. 8·7 lbs/H.P.
SPEED MAX.: 200 km.p.h. 124 m.p.h.
" at 5000 m.: 170 " 105 "
CEILING: 6000 m. 19700 ft.

THE L. & O. FLOAT SEAPLANE. TYPE LEO H.10.

The most noticeable feature of this machine is the system of wing bracing employed. Struts in the form of inverted V's run from the front and rear spars on the centre line of the machine down to the floats, and are tied together by the usual float axles. In these inverted Vees the fuselage is carried.

From the junction of the rear float axle with the legs of the above-mentioned struts other struts run outwards to front and rear spars of the bottom wing and thence to the front rear spars of the top plane. So far the bracing is very similar to that used on certain of the P.V. machines built at the British Experimental Establishment, Isle of Grain, during the war.

But in this case the bottom wing is of span and chord equal to the top plane, and the overhang of the bottom wing is supported by a further pair of struts running downwards and outwards from the top plane and strut junctions.

The rear float "axle" is vertically below the rear spars. All the rear struts lie in a vertical plane. The struts up to the bottom front spar rake forward at some 30°. There are streamline wire bracings between the both sets of interplane struts and drag bracings forward to the float from the lower and to the fuselage from the upper wings.

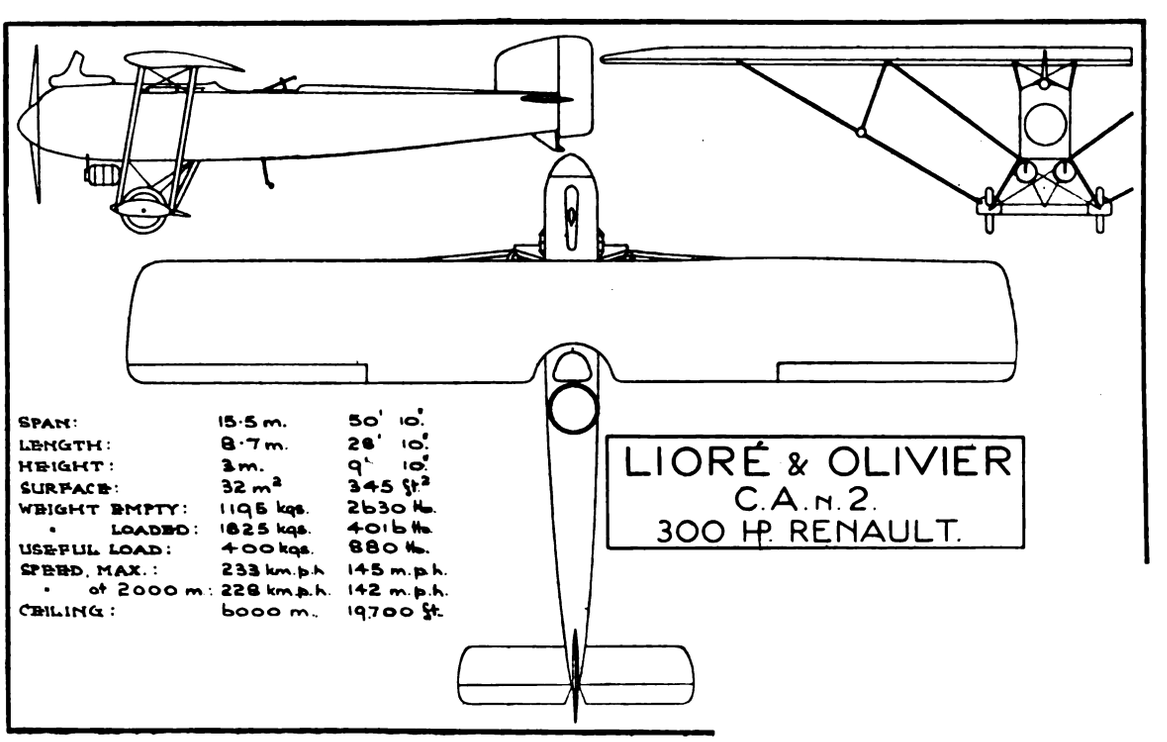
The wings fold on a hinge line parallel to the rear struts which embrace the fuselage and are prolonged down to the float. As this line is inclined very considerably to the vertical, the wings when folded take up a distinctly curious position.

The wings are of the same section as is used on the flying-boat, and like those wings, are cut off square at the tips.

Ailerons are fitted on bottom wings only and are of very narrow chord.

The floats are of a form strikingly similar to those generally used on the later German float seaplanes. They are of very considerable length, and no tail float—or water rudder—is provided.

This machine is generally of standard timber construction with metal struts. Steel tube is generally used for this purpose, with duralumin fairings. But for some curious reason the designer has seen fit to use bronze of some sort for many of the fittings—such as for the nuts on the strut end fittings—and one would be greatly surprised if the admixture of metals when exposed to salt water did not lead to very serious corrosion trouble.


LIORÉ & OLIVIER
C.A.N.2.
300 HP. RENAULT.
SPAN: 15·5 m. 50' 10"
LENGTH: 8·7 m. 28' 10"
HEIGHT: 3 m. 9' 10"
SURFACE: 32 m² 345 ft²
WEIGHT EMPTY: 1195 kgs. 2630 lbs.
" LOADED: 1825 kgs. 4016 lbs.
USEFUL LOAD: 400 kgs. 880 lbs.
SPEED, MAX.: 233 km.p.h. 145 m.p.h.
" at 2000 m: 228 km.p.h. 142 m.p.h.
CEILING: 6000 m. 19700 ft.

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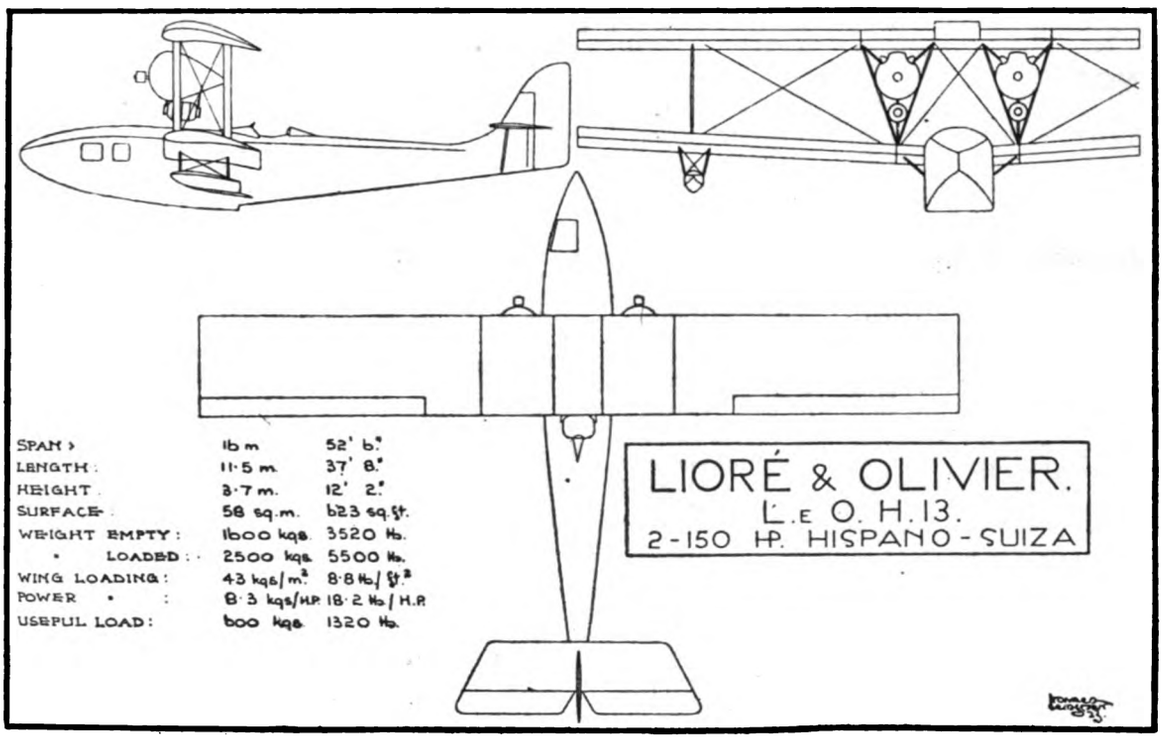
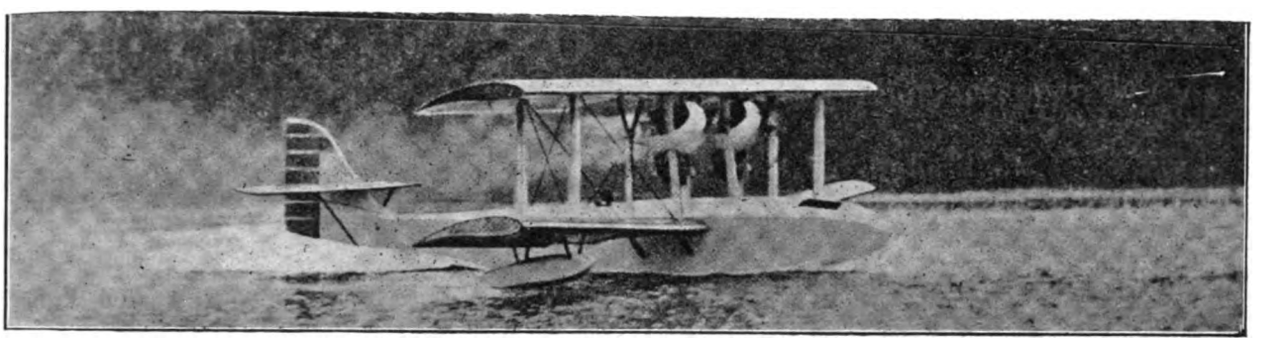
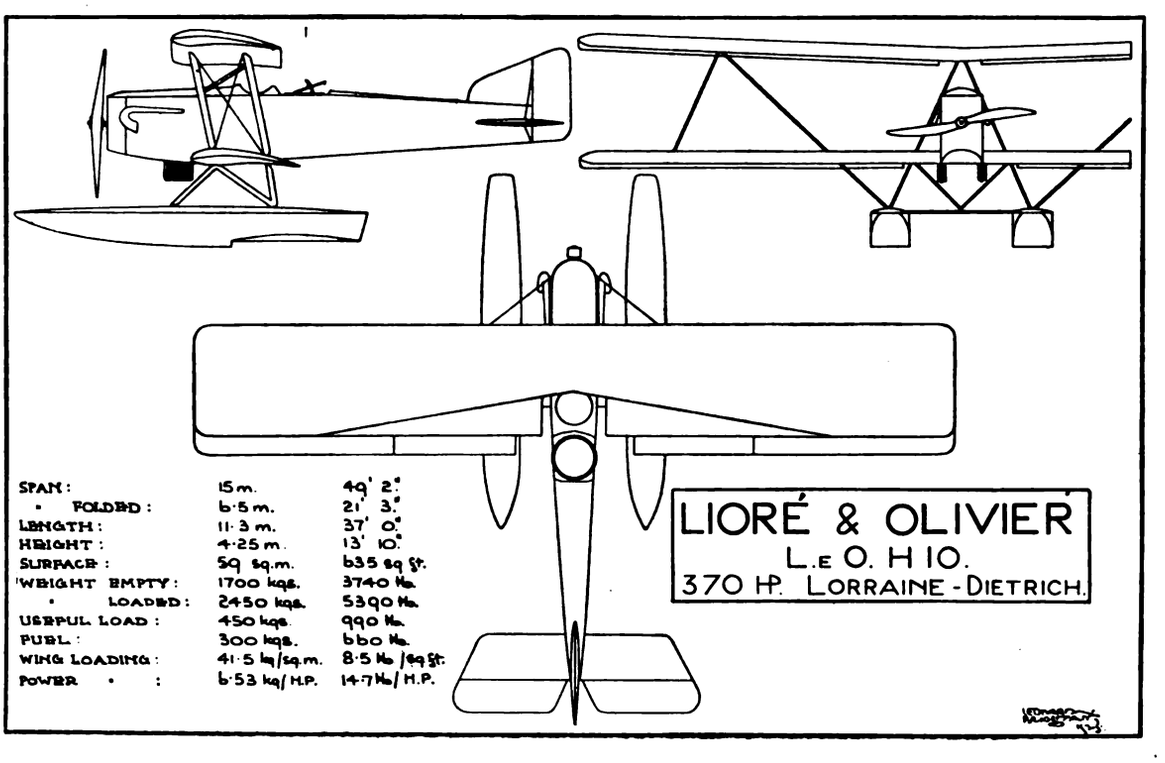
LIORÉ & OLIVIER—continued.


LIORÉ & OLIVIER.
L.E O. H.13.
2-150 HP. HISPANO-SUIZA
SPAN : 16 m 52' 6"
LENGTH : 11·5 m. 37' 8"
HEIGHT : 3·7 m. 12' 2"
SURFACE : 58 sq.m. 623 sq.ft.
WEIGHT EMPTY : 1600 kgs. 3520 lb.
" LOADED : 2500 kgs. 5500 lb.
WING LOADING : 43 kgs/m² 8·8 lb/ft²
POWER " : 8·3 kgs/H.P. 18·2 lb/H.P.
USEFUL LOAD : 900 kgs. 1320 lb.



The Lioré et Olivier H.13 Flying Boat (2-150 h.p. Hispano-Suiza engines).


LIORÉ & OLIVIER
L.E O. H 10.
370 HP. LORRAINE-DIETRICH.
SPAN : 15 m. 49' 2"
" FOLDED : 6·5 m. 21' 3"
LENGTH : 11·3 m. 37' 0"
HEIGHT : 4·25 m. 13' 10"
SURFACE : 50 sq.m. 535 sq ft.
WEIGHT EMPTY : 1700 kgs. 3740 lb.
" LOADED : 2450 kgs. 5390 lb.
USEFUL LOAD : 450 kgs. 990 lb.
PUBL : 300 kgs. 660 lb.
WING LOADING : 41·5 kg/sq.m. 8·5 lb/sq ft.
POWER " : 6·53 kg/H.P. 14·7 lb/H.P.

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M

DE MONGE.

M. Louis de Monge, the designer of the Lumière airscrews, designed and built in 1921, a very interesting racing monoplane—described in the last volume of "All The World's Aircraft." He has since joined the Buscaylet firm which see for his modern products.

MORANE-SAULNIER.

Aeroplanes Morane-Saulnier, 3, Rue Volta, Puteaux (Seine). School : Villacoublay.

The Morane machines, particularly the Parasol monoplanes, rendered great services during the earlier part of the War.

The firm later turned out a number of biplanes, including certain two-engined machines.

But their more important products have so far been of the "parasol" monoplane type.

Of these the single-seater "Type A.S. Sport" differs little from the parasol Morane of pre-war times. Ailerons are fitted instead of the warping wings, the wing bracing-wires have reverted to piano wire, where—if one remembers aright—there were cables of reassuring dimensions before.

The wings are slightly swept back, and the 80-h.p. Le Rhône is installed in place of the 80 h.p. Gnôme of the 1914 type.

The ailerons are operated by rods and levers turning the tube to which they are attached—much as in the early Nieuports, and the fuselage is faired off to a rounded section. Otherwise, it is difficult to distinguish it from the familiar Moranes of the summer of 1914.

The two-seater monoplane type A.R. differs little from the single-seater. There is no sweep back to the wings; but, otherwise, the machines appear to be identical, and the same engine—an 80 h.p. Le Rhône—is fitted.

The third monoplane, Type A.I.—a high-speed single-seater fitted with either the 120 h.p. or the 180 h.p. Le Rhône, is also a Parasol—generally very similar to the preceding machines, but fitted with a wonderfully complex rigid bracing of steel tube below the wings, cross-braced fore and aft with cable, which must add at least cent. per cent. to the drag loads on the wing structure. The machine is said to be designed for "La Haute Ecôle d'Acrobatie" and for rapid light transport work, and is used by the French Air Service.

These machines were all described in the 1920 volume of "All the World's Aircraft."

The Morane firm won first prizes in two categories in the competition organised in summer, 1923, by the French Army Air Service for training machines. The winner in the elementary training class was the standard A.R. two-seater. For the class known as E.T.2, for two-seater transition training, the firm produced the type 43, hereafter described.

THE MORANE-SAULNIER TYPE 43.

A two-seater dual control biplane with 180 h.p. Hispano-Suiza engine for advanced training purposes. Is a normal single-bay biplane with a considerable overhang on the top wing, which is braced by diagonal struts. Normal wooden construction is employed, except for the undercarriage, which is of steel, and the ailerons and tail surfaces, which are framed in duralumin tube.

The undercarriage is of the Morane type—a "W" in front view and a "V" in side view. All the undercarriage attachments to the fuselage are in the form of universal joints, in order that breakage of the undercarriage shall not destroy the fuselage longerons. Houdaille shock-absorbers are fitted to the axle.

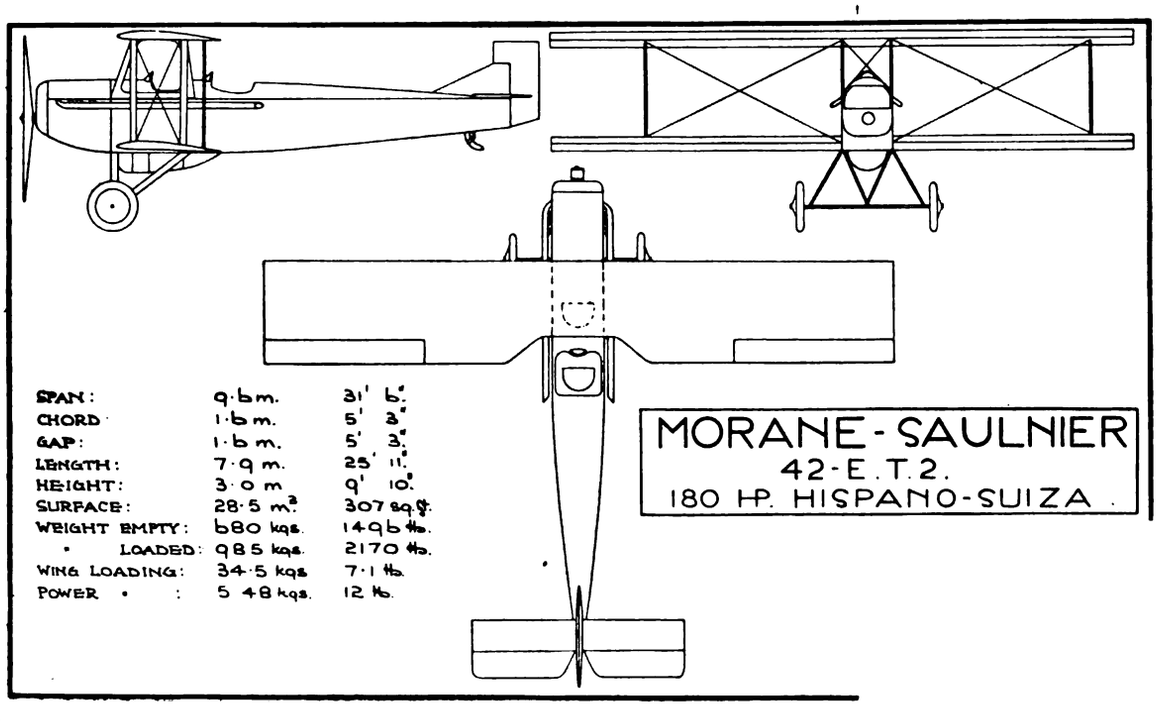
The engine-mounting, with radiator and all auxiliaries, including oil tanks, petrol pumps and engine instrument board and controls, forms a separate unit, removable from the fuselage by undoing four screws. The petrol tank is carried below the fuselage, just behind the engine mounting, and two connections from tank to petrol pumps only have to be made or broken to replace or remove a power unit.

One seat is below the centre section, the other behind. Normally the pupil uses the front seat. The control stick in the after cockpit is easily removable.

Great care has been taken in the design to secure firstly great robustness throughout and secondly ease of repair maintenance.

Specification.

Span	**10.88 m. (35 ft. 5 in.).**
Length	**7.86 m. (25 ft. 9 in.).**
Height	**3.10 m. (10 ft. 2 in.).**
Wing area	**28.5 sq. m. (306 sq. ft.).**
Weight empty	**800 kgs. (1,760 lbs.).**
Fuel	**150 kgs. (330 lbs.).**
Weight loaded	**1,120 kgs. (2,464 lbs.).**
Engine	**Hispano-Suiza, 180 h.p.**
Wing loading	**39.3 kgs./sq. m. (8.1 lbs./sq. ft.).**
Power loading	**6.23 kgs./h.p. (13.7 lbs./h.p.).**
Max. speed at 4,000 m. (13,120 ft.)	**162 km.h. (101 m.p.h.).**
Climb to 3,000 m. (9,840 ft.)	**14 mins. 21 secs.**
Ceiling	**5,500 m. (18,000 ft.).**
Endurance (full power)	**3 hours.**


SPAN: 9·6 m. 31' 6"
CHORD 1·6 m. 5' 3"
GAP: 1·6 m. 5' 3"
LENGTH: 7·9 m. 25' 11"
HEIGHT: 3·0 m 9' 10"
SURFACE: 28·5 m² 307 sq ft.
WEIGHT EMPTY: 680 kgs. 1496 lbs.
LOADED: 985 kgs. 2170 lbs.
WING LOADING: 34·5 kgs 7·1 lbs.
POWER : 5 48 kgs. 12 lbs.
MORANE-SAULNIER
42-E.T.2.
180 HP. HISPANO-SUIZA

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MUREAUX.

Ateliers des Mureaux, Les Mureaux (Seine-et-Oise).

The Ateliers des Mureaux are constructing Vickers Vimy Commercials under licence and have several in hand for the "Air Union" for their London-Paris and London-Lausanne services. This machine is known as the "Express Vimy" and is fitted with 2—370 h.p. Lorraine-Dietrich engines.

Specification of the "Express Vimy."

Span	**20.72 m. (68 ft.).**
Height	**4.62 m. (15 ft. 2 in.).**
Length	**13.3 m. (43 ft. 8 in.).**
Weight empty	**3,396 kgs. (7,450 lbs.).**
Weight loaded	**5,670 kgs. (12,400 lbs.).**
Speed at ground level	**185 km.p.h. (115 m.p.h.).**
Speed at 1,000 m.	**180 km.p.h. (112 m.p.h.).**
Speed at 2,000 m.	**175 km.p.h. (109 m.p.h.).**
Ceiling	**4,570 m. (15,000 ft.).**

THE EXPRESS MARIN.

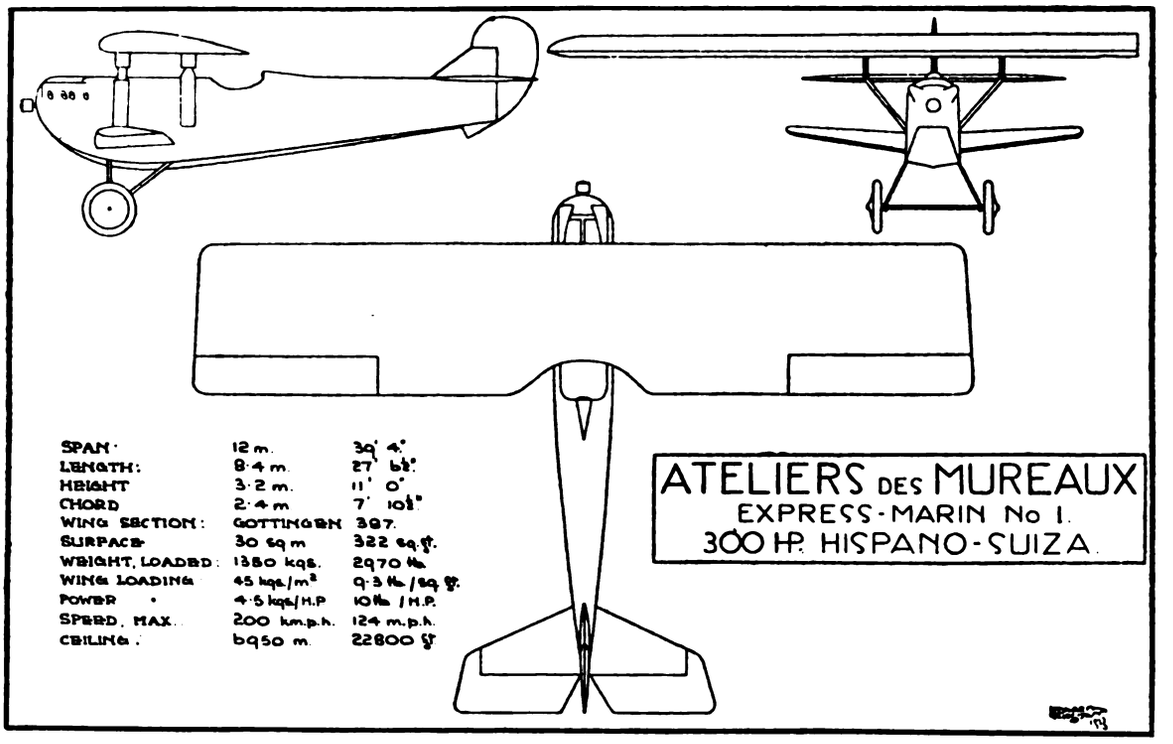
The firm are also constructing a ship-plane known as "Express-Marin No. 1." This is a parasol monoplane of ordinary wood construction. The wing tips are watertight, the fuselage is of three-ply, with a step forward for landing in the sea. Below the main plane, and at the base of the fuselage, there are two small wing roots similar to those found on various Dornier flying-boats.

In place of a tail skid, a species of cone-anchor or drogue is placed at the extreme rear of the fuselage, intended to act as a brake and also to admit water to the rear fuselage compartment to preserve alignment on alighting on the water and to prevent the machine from nosing over.

The undercarriage can be released.

The tail unit is entirely of welded steel tube.

They also have in hand a high-power long-range torpedo-carrier for the French Navy.


SPAN 12 m. 39' 4"
LENGTH: 8·4 m. 27' 6½"
HEIGHT 3·2 m. 11' 0"
CHORD 2·4 m 7' 10½"
WING SECTION: GOTTINGEN 397.
SURFACE 30 sq m 322 sq ft.
WEIGHT, LOADED: 1350 kgs. 2970 lbs
WING LOADING 45 kgs/m² 9·3 lbs/sq ft.
POWER 4·5 kgs/H.P 10 lbs / H.P.
SPEED, MAX. 200 km.p.h. 124 m.p.h.
CEILING 6050 m. 22800 ft
ATELIERS DES MUREAUX
EXPRESS-MARIN No 1.
300 HP. HISPANO-SUIZA.

N

NIEUPORT.

Nieuport Astra, 46, Boulevard Gallieni, Issy-les-Moulineaux (Seine). *School:* Villacoublay (Seine and Oise). Established 1910 by the late Edouard de Nieport, commonly called Nieuport.

The original *Nieuport* biplane was one of the greatest successes of the war, owing to its high speed and quickness in manœuvre. The lower plane in this type is so small that the machine is really a "parasol," with half a plane attached to give girder formation to the wing bracing. It was frequently called the "one-and-a-half plane."

In addition to their land and float seaplane machines, the Nieuport firm have taken over the Tellier flying-boat interests.

In 1921, the Nieuport firm and the Astra Company of airship fame were amalgamated as Nieuport-Astra.

THE NIEUPORT-DELAGE TYPE 29C.1.

This machine, which is in all essentials the same as the type which once held the world's height record, and from which the racing biplanes of recent years were derived, is in regular use by the French Air Service.

The machine is fitted with a monocoque body, built up of spiral layers, alternatively right and left-handed, of tulip wood veneer wrapped round a former, which is ultimately removed. The skin thus formed is stiffened by a series of light internal

The Nieuport-Delage type 29C.I. Fighter (300 h.p. Hispano-Suiza engine). o2

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NIEUPORT—*continued.*

stringers behind the pilot's seat, and by a set of plywood bulkheads forward. These bulkheads carry the engine bearers, which are prolonged backwards to carry the pilot's seat and his controls.

The fixed tail plane and the fin are built integral with the fuselage and covered with the tulip wood skin. The lower wing roots are also built in one with the fuselage.

The wings are of normal biplane type, with two bays of bracing on each side of the fuselage. There is a slight dihedral to upper wing only, and the top wing is staggered forward 10 degs.

The undercarriage is of normal Vee type, the Vees themselves being built up of multi-ply wood, fitted with a hinged axle.

The engine is a 300 h.p. Hispano-Suiza, cooled by a pair of "Lamblin" radiators, carried between the undercarriage Vees.

The main petrol tank (capacity 147 litres) is within the fuselage, between engine and pilot, and pressure feeds two gravity tanks (total capacity 62 litres), one in each upper wing.

An oil tank (capacity 22 litres) is fitted immediately below the engine crankcase. Its lower surface forms the bottom fuselage surface, and is corrugated, to provide cooling.

The machine is equipped with two synchronized Vickers guns firing ahead. Also, as part of its standard war load, the machine carries a wind-driven generator to supply electricity for heating the pilot's clothing and for lighting purposes.

Specification of the Type 29C.1.

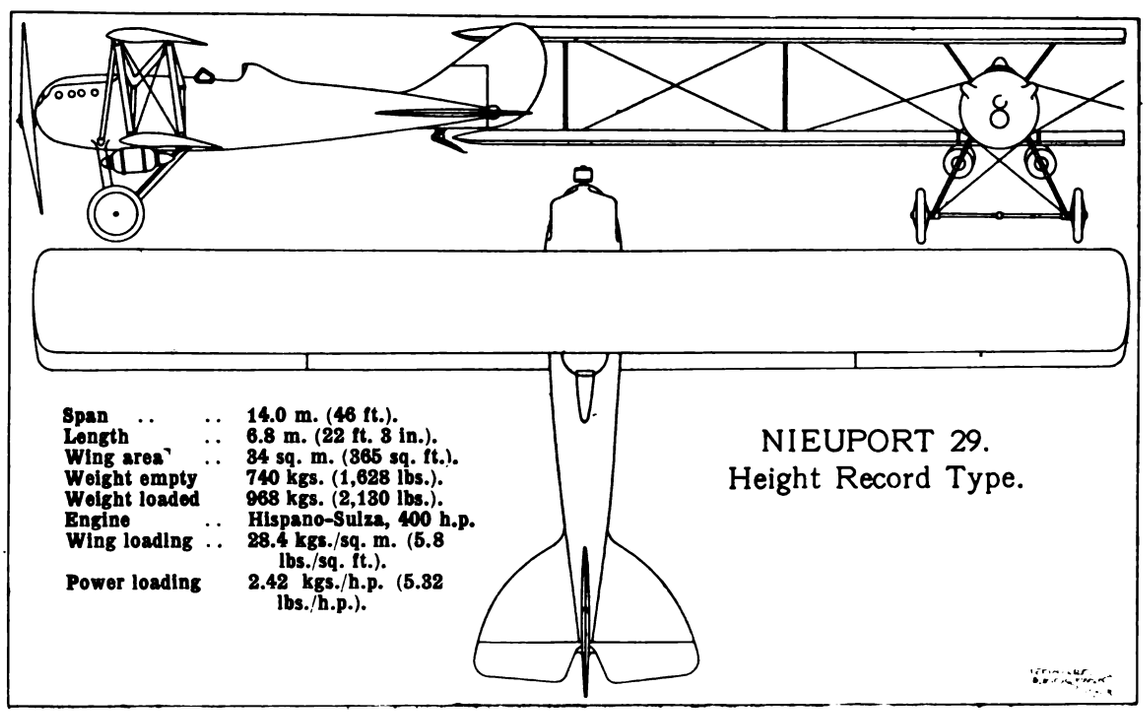
Span	**9.7 m.**
Length	**6.44 m.**
Height	**2.26 m.**
Chord	**1.5 m.**
Wing area	**26.88 sq. m.**
Engine	**300 h.p. Hispano-Suiza.**
Weight empty	**750 kgs.**
War load.	
Pilot	**80 kgs.**
Guns	**73 kgs.**
Instruments	**17 kgs.**
Total useful load	**170 kgs.**
Fuel	**154 kgs.**
Oil	**15 kgs.**
Total load	**339 kgs.**
Weight loaded	**1,089 kgs.**
Wing loading	**41 kgs. per sq. m.**
Weight per h.p.	**3.5 kgs.**
Performance.	
Max. speed at 2,000 m.	236 km.p.h.
Max. speed at 6,000 m.	210 km.p.h.
Climb.	
To 2,000 m.	4 mins. 19 secs.
To 6,000 m.	18 mins. 46 secs.
Ceiling	8,500 m.

THE NIEUPORT HIGH RECORD MACHINE.

This machine, specially built to recapture from America the world's height record, is a modified type 29 fitted with wings of abnormal span and of distinctly thick section. It is fitted with a specially boosted Hispano-Suiza engine which develops 400 h.p. at 2,000 r.p.m.

THE NIEUPORT-DELAGE SESQUI-PLAN.

The photographs reproduced together with the scale drawing and specification, on this page, give a very clear idea of the general features of the Nieuport racing machine which won the 1921 competition for the Deutsch Cup, covering the 300 km. course in 1 hour 4 mins. 39 secs., at an average speed of 281.1 km.p.h. (175.2 m.p.h.).



Span	**14.0 m. (46 ft.).**
Length	**6.8 m. (22 ft. 3 in.).**
Wing area	**34 sq. m. (365 sq. ft.).**
Weight empty	**740 kgs. (1,628 lbs.).**
Weight loaded	**968 kgs. (2,130 lbs.).**
Engine	**Hispano-Suiza, 400 h.p.**
Wing loading	**28.4 kgs./sq. m. (5.8 lbs./sq. ft.).**
Power loading	**2.42 kgs./h.p. (5.32 lbs./h.p.).**

NIEUPORT 29.
Height Record Type.

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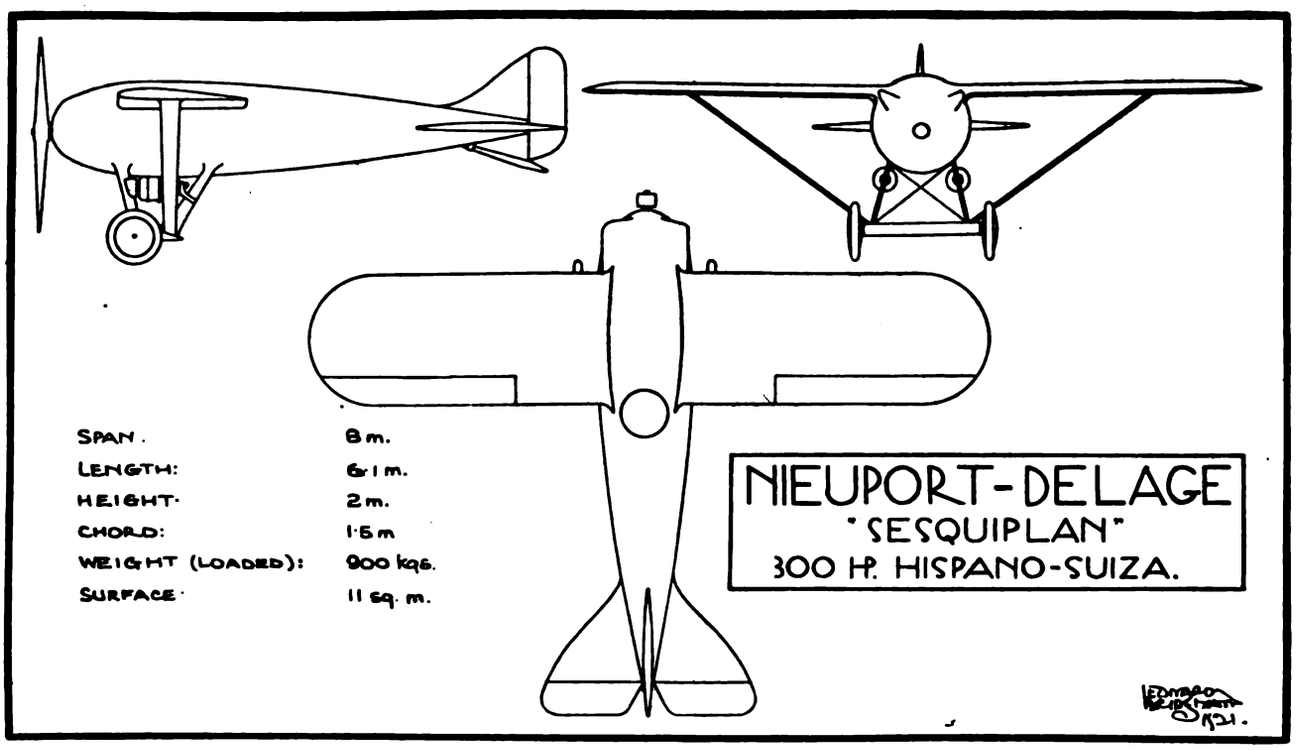
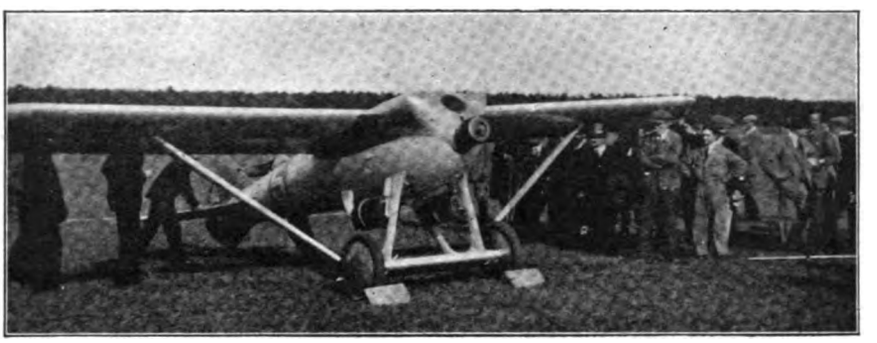
NIEUPORT*—*continued.





The 1922 Sesquiplan.

The machine is known as the "Sesqui-plan," which means "one-and-a-bit plane." This name is given in view of the fact that the fairing of the undercarriage axle forms a small lifting surface.

In all essential features, the machine greatly resembles a machine produced by the same firm in 1919, fitted with a 180 h.p. Le Rhône engine. This earlier type was also in its day a record-breaker, but was later outclassed by the 300 h.p. Hispano-engined biplane.

In the new version of the monoplane—for such in fact it is—a very considerable amount of cleaning up has occurred. The undercarriage has been simplified, there is now only one wing bracing strut on each side, a monocoque body is fitted in place of one faired with laths and fabric. Altogether the new version presents about as little in the way of useless resistance as is possible in an aeroplane of normal type, and it seems unlikely that much more remains to be done in the way of cleaning up, short of abandoning altogether the type of construction wherein wings, body, undercarriage and tail are recognisably distinct organs.

The fuselage construction is practically identical with that of the type 29, and the form thereof is very similar. The cowling over the engine has been modified, and is of smoother outline than in the earlier type.

The wing spars, of box section spruce, are built into the upper part of the fuselage, and are supported on each side by a single strut running from the rear leg of the undercarriage to a point about two-thirds of the half span out from the body.

This undercarriage is of the usual type, except that it is so wide at the base of the Vees that it affords an attachment for the bracing strut behind the landing wheel. The legs are built up multi-ply poplar, and the horizontal coupling between the two sides takes the form of a small lifting surface, within which the axle is completely enclosed.

The Sesqui-plan was for some time the holder of the world's speed record, finally achieving the speed of 350 km.p.h., (217 m.p.h.) on Feb. 3rd, 1923. The record however, had by this time passed to America. On Feb. 15th, 1923, M. Sadi Lecointe, on a modified "Sesquiplan" fitted with a boosted Hispano-Suiza engine giving 400 h.p. and with radiators incorporated in the wings, flew at a speed of 377.67 km.p.h. (234 m.p.h.) over the kilometre course, thus regaining for France the world's speed record, but this has again passed to the U.S.A.

A new Sesquiplan was ready for test in the spring of 1924, fitted with a new 12 cylinder Hispano-Suiza engine. Strong hopes that this machine will regain the speed record for France are entertained.

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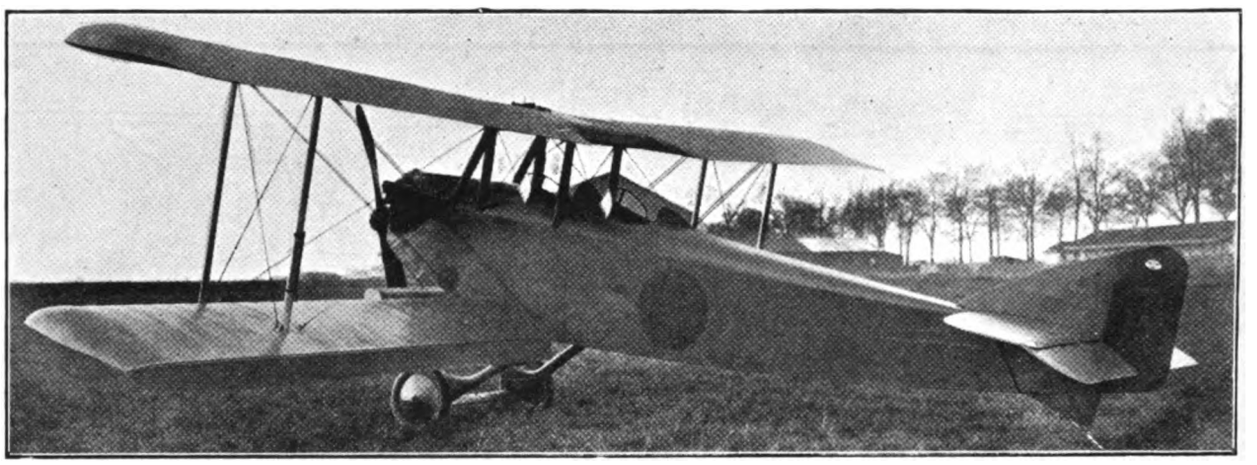
NIEUPORT*—*continued.



The Nieuport 38 (200 h.p. Hispano-Suiza.)

THE NIEUPORT TYPE 33H.S.

A tandem two-seater high-performance school machine with the 300 h.p. Hispano-Suiza engine. Is an equal-winged biplane with a slight dihedral on the top plane only. A single pair of struts of profiled duralumin and streamline wire crossbracing are used.

The fuselage is of rectangular section, with a rounded top, with ash longerons in front and spruce behind, with wire cross-bracing. Complete dual control is fitted, but the control lever in the after seat is removable.

Specification.

Span	**10.0 m. (32 ft. 9 in.).**
Length	**7.75 m. (25 ft. 5 in.).**
Wing area	**32 sq. m. (344 sq. ft.).**
Weight empty	**882 kgs. (1,940 lbs.).**
Fuel	**168 kgs. (372 lbs.).**
Weight loaded	**1,280 kgs. (2,816 lbs.).**
Engine	**Hispano-Suiza, 300 h.p.**
Wing loading	**40 kgs./sq. m. (8.2 lbs./ sq. ft.).**
Power loading (320 h.p.)	**4 kgs./h.p. (8.8 lbs./h.p.).**
Max. speed	**220 km.h. (137 m.p.h.).**
Climb to 3,000 m. (9,840 ft.)	**10 mins. 10 secs.**
Ceiling	**6,000 m. (19,600 ft.).**

THE NIEUPORT-DELAGE TYPE 38.

A general utility machine for civil purposes. It can be fitted with any stationary engine of about 200 h.p., the 180 h.p. Hispano-Suiza being standard. As the engine is caused in a readily dismountable housing change in the type of engine involves no structural alteration.

The fuselage is also arranged so that various forms of equipment can easily be provided—thus a cabin for a passenger, or arrangements for carrying cameras for photographic work may be rapidly exchanged.

The machine is fitted with side-by-side dual control.

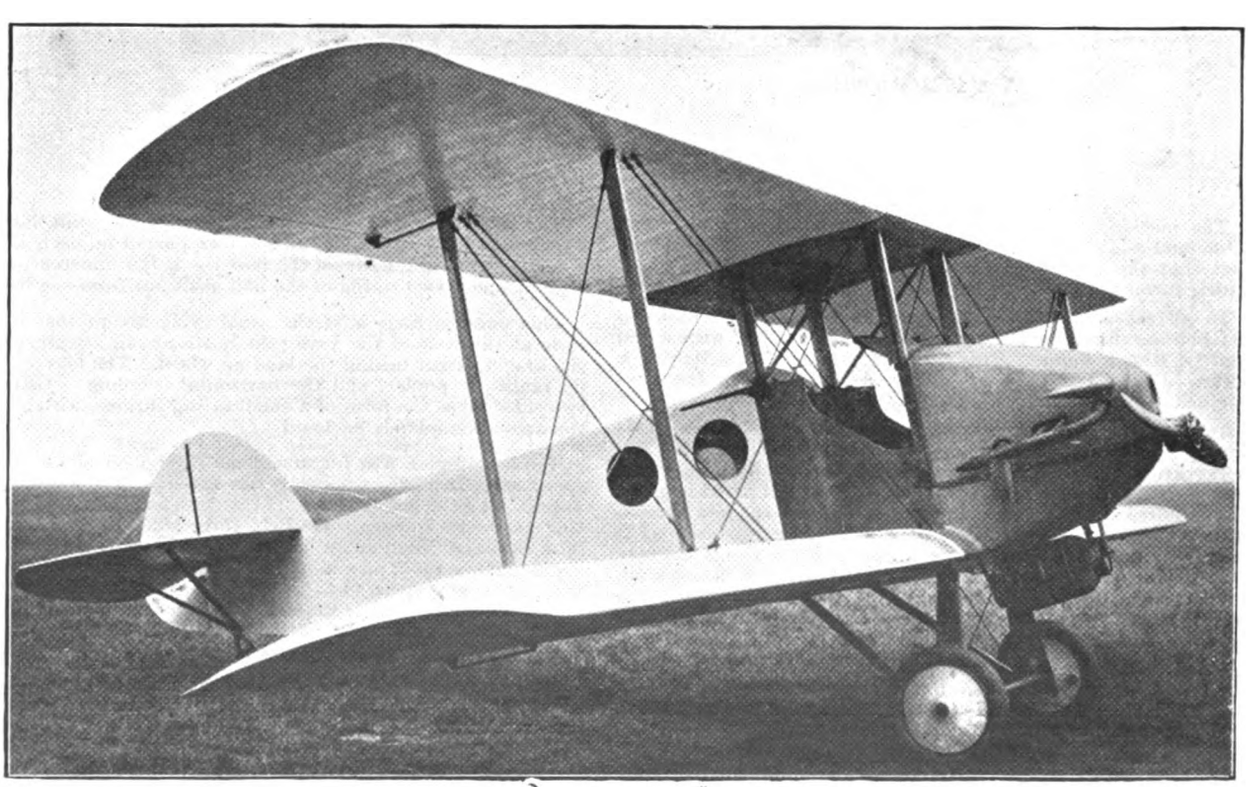
The undercarriage and the engine housing, together with the central section of the wings are of metal construction.

Top and bottom wings on each side are identical and interchangeable. Flaps are fitted to both top and bottom wings, those of the bottom wings serving as ailerons and those on the top wing being separately controlled and used for trimming the craft for varied loadings.

The fuselage proper is built on four longerons with light struts and three-ply covering. It is attached to the rigid centre section structure by four bolts, and can be readily removed. Fuselages containing either a cabin for two passengers or with accommodation for photographic and the like undertakings, or simply a closed tail-carrying unit may be interchanged rapidly. The side-by-side pilot's seat forms part of the permanent central section.

Specification.

Span	**11.10 m. (36 ft. 5 in.).**
Length	**8.0 m. (26 ft. 2 in.).**
Height	**3.50 m. (11 ft. 5½ in.).**
Wing area	**37.8 sq. m. (407 sq. ft.).**
Weight empty	**850 kgs. (1,870 lbs.).**
Fuel	**150 kgs. (330 lbs.).**
Weight loaded	**1,250 kgs. (2,750 lbs.).**
Wing loading	**33.1 kgs./sq. m. (6.75 lbs./ sq. ft.).**
Power loading (200 h.p.)	**6.25 kgs./h.p. (13.75lbs./ h.p.).**



The Nieuport 38.

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P

PENHOET.

Chantier et Ateliers de St. Nazaire (Penhoet), St. Nazaire and Grand Ouevilly, near Rouen.

Big firm of shipbuilders, including battleships, cruisers, torpedo craft, liners, cargo boats, etc. Have taken up construction of aircraft and are building a five-engined monoplane flying-boat.

The central hull has one tractor engine, and on the wings are mounted two engine-housings containing one tractor and one pusher engine each. The total horsepower amounts to 2,000. The span of the machine is 40 m. (131 ft.) and the length 26 m. (85 ft.), approximately.

POTEZ.

Henry Potez, 14, Rue Clément, Levallois-Perret.

This firm is the successor of the concern which, in war-time, was known by the title S.E.A.

Potez machines have done excellent work during the past two years on various French civilian air services, particularly on the Paris-Strasbourg-Warsaw route.

THE POTEZ TYPE VIII R.

This is a modified edition of the curious little type VIII machine illustrated and described in the 1920 issue of "All the World's Aircraft." It differs mainly in that a 45 h.p. Anzani engine is used in place of the curious 4-cylinder engine with the vertical crankshaft and bevel drive, and in the adoption of a normal "Vee" undercarriage in place of the four-wheeled type.

THE POTEZ TYPE IXS.

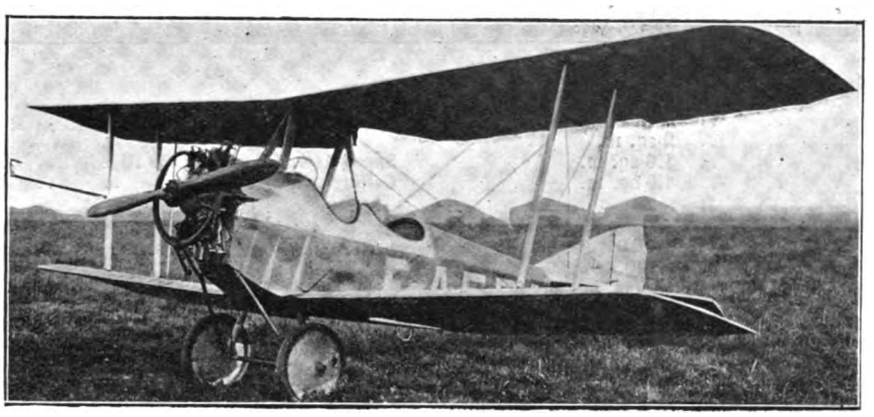
A single-engined passenger carrier of conventional type, fitted for four passengers within the cabin. The general features are adequately shown by the illustrations.

THE POTEZ TYPE XII.

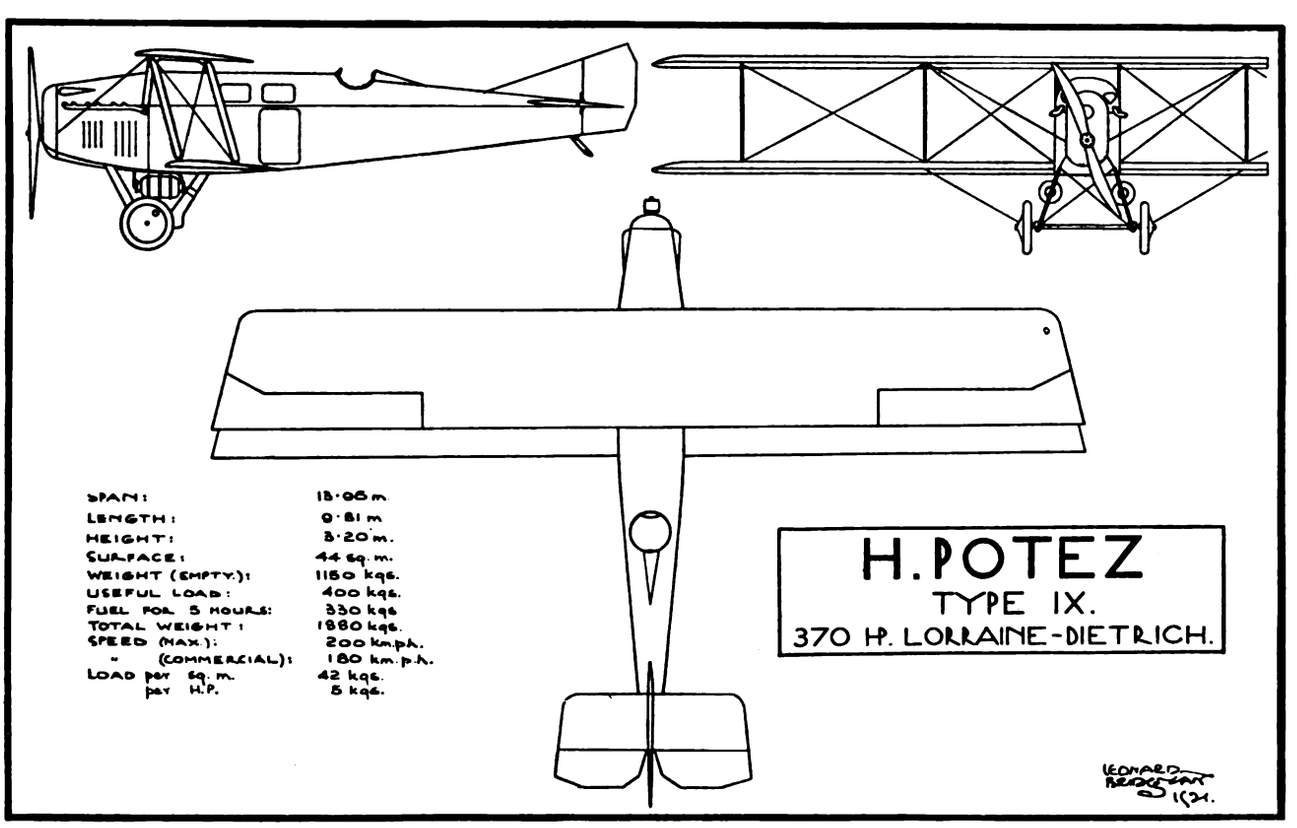
A two-seater tractor biplane, apparently destined for military purposes. The specification contains such details as are available.

Specification of the Potez XII.

Type and purpose	**Two-seater High Performance Biplane.**
Span (top plane)	**10 m.**
Span (bottom plane)	**7.6 m.**
Overall length	**7.615 m.**
Total area of wings	**26.5 sq. m.**



The Potez type VIII (45 h.p. Anzani engine).



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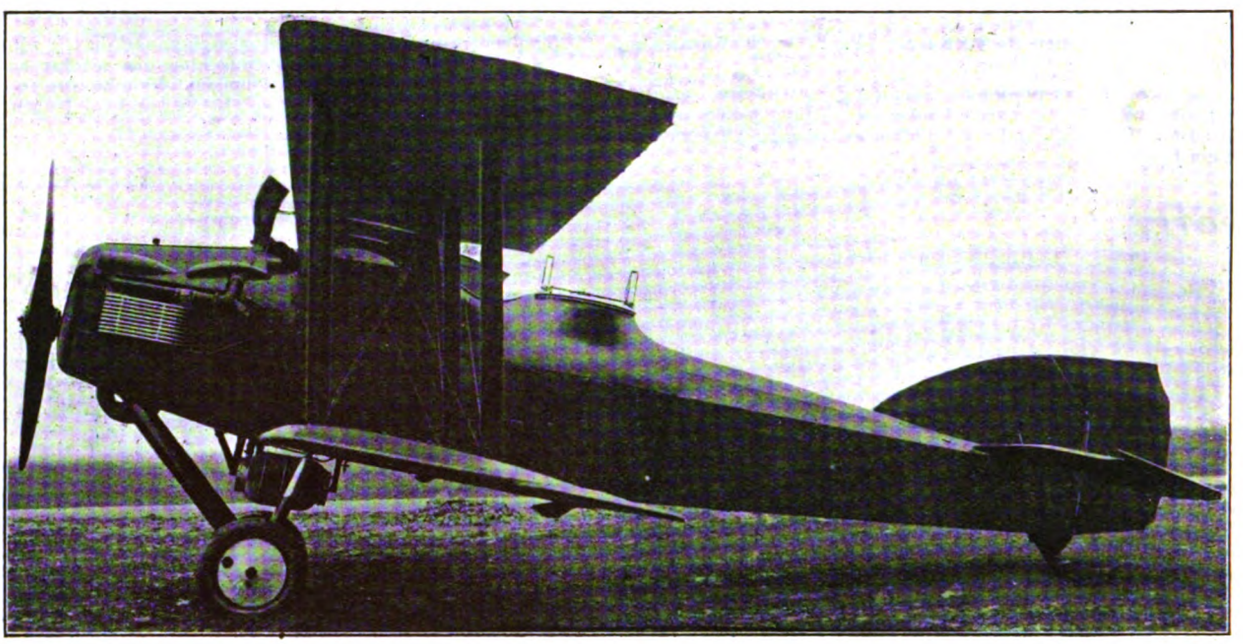
POTEZ—continued.



The Potez Type XI.CAP. 2.

Span of tail	**3.18 m.**
Area of tail	**2 sq. m.**
Area of elevators	**1.6 sq. m.**
Area of rudder	**1.0 sq. m.**
Area of fin	**.55 sq. m.**
Engine	**370 h.p. Lorraine-Dietrich 12D.**
Weight loaded	**1,300 kgs.**
Wing loading	**49 kgs. per sq. m.**
Weight per h.p.	**3.5 kgs.**
Performance.	
Max. speed, low down	250 km.p.h.

THE POTEZ TYPE XI.CAP.2.

This is a reconnaissance two-seater, largely of duralumin construction, fitted with a Rateau supercharger and a Levasseur variable pitch airscrew. Evidently intended for work at the highest altitudes, the performance estimated for this type scarcely suggests that full advantage has been taken of the power plant employed.

Specification of the Potez Type XI.

Span	**12.7 m. (41 ft. 8 in.).**
Length	**9.08 m. (29 ft. 9 in.).**
Height	**3.16 m. (10 ft. 4 in.).**
Chord	**1.80 m. (5 ft. 11 in.).**
Area	**44 sq. m. (484 sq. ft.).**
Weight empty	**1,250 kgs. (2,750 lbs.).**
Weight loaded	**1,900 kgs. (4,180 lbs.).**
Engine	**Lorraine, 370 h.p.**
Wing loading	**43 kgs./sq. m. (9.4 lbs./sq. ft.).**
Power loading	**4.75 kgs./h.p. (10.5 lbs./h.p.).**
Speed at 4,000 m. (13,120 ft.)	**200 km.h. (124 m.p.h.).**
Ceiling	**8,000 m. (26,200 ft.).**

THE POTEZ TYPE XV.

A two-seater reconnaissance and fighter machine built for the French Air Service, of the standard tractor type.

The fuselage, built on wire-braced and strutted longerons, is covered in three-ply over the whole of the pilot and passenger space, and is stiffened by plywood bulkheads. The rear end is of the stick and string type. Both seats are behind the wings, pilot ahead and gunner aft. A forward-firing machine gun, synchronized, is fitted, and the aft seat has the usual "Scarff" ring mounting.

The wings are unstaggered, equal in span and chord, and are fitted with two rows of interplane struts on each side. The upper centre section is carried on a pair of inverted U struts above the fuselage. This machine has been ordered by the French Air Service in large quantities.

THE POTEZ TYPE XXII.

A three-engined passenger carrier fitted with Gnôme-Rhône "Jupiter" engines of 380 h.p. each. These are equipped with a gas starter of the type developed by the Bristol Co., designers of the "Jupiter" engine.

The machine is a normal biplane, mostly of standard timber construction. All three engines drive tractor airscrews, and appears to be a modified version of the type XXIII. The machine is fitted with a cabin for 12 passengers.

The Potez Type XV.

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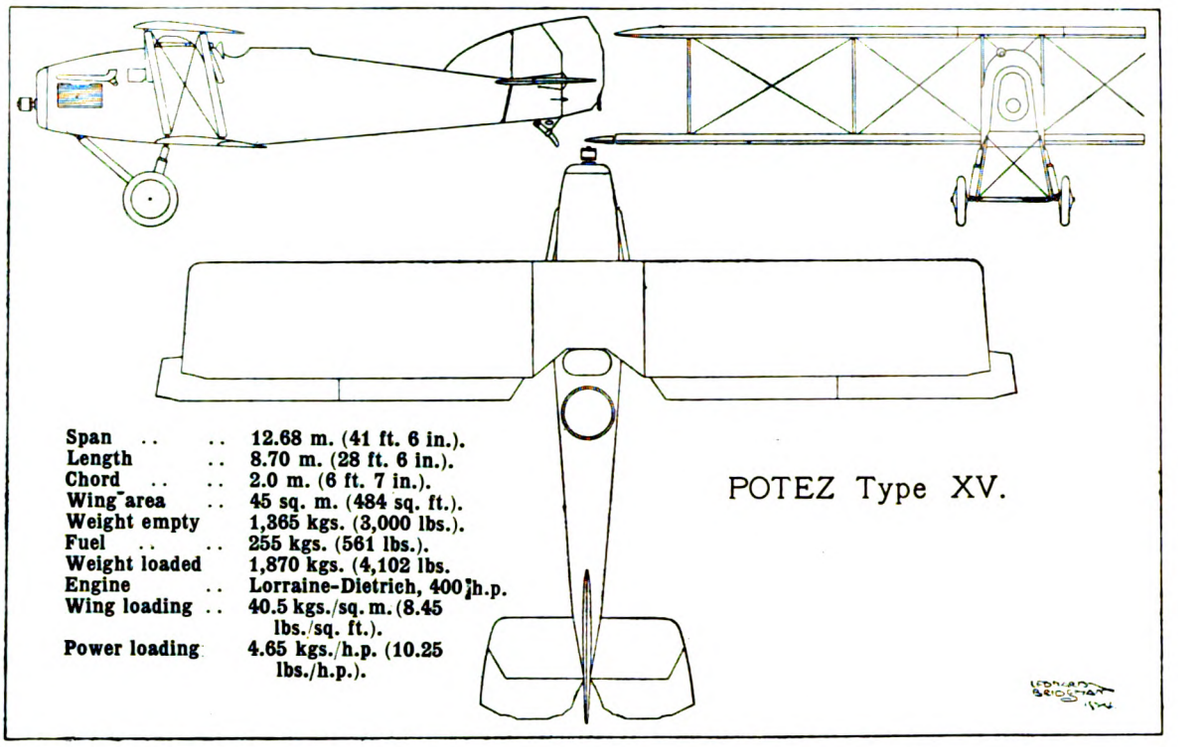
POTEZ—*continued.*



Span	12.68 m. (41 ft. 6 in.).
Length ..	8.70 m. (28 ft. 6 in.).
Chord	2.0 m. (6 ft. 7 in.).
Wing area ..	45 sq. m. (484 sq. ft.).
Weight empty	1,365 kgs. (3,000 lbs.).
Fuel	255 kgs. (561 lbs.).
Weight loaded	1,870 kgs. (4,102 lbs.
Engine ..	Lorraine-Dietrich, 400 h.p.
Wing loading ..	40.5 kgs./sq. m. (8.45 lbs./sq. ft.).
Power loading	4.65 kgs./h.p. (10.25 lbs./h.p.).

POTEZ Type XV.

Specification of the Potez Type XXII.

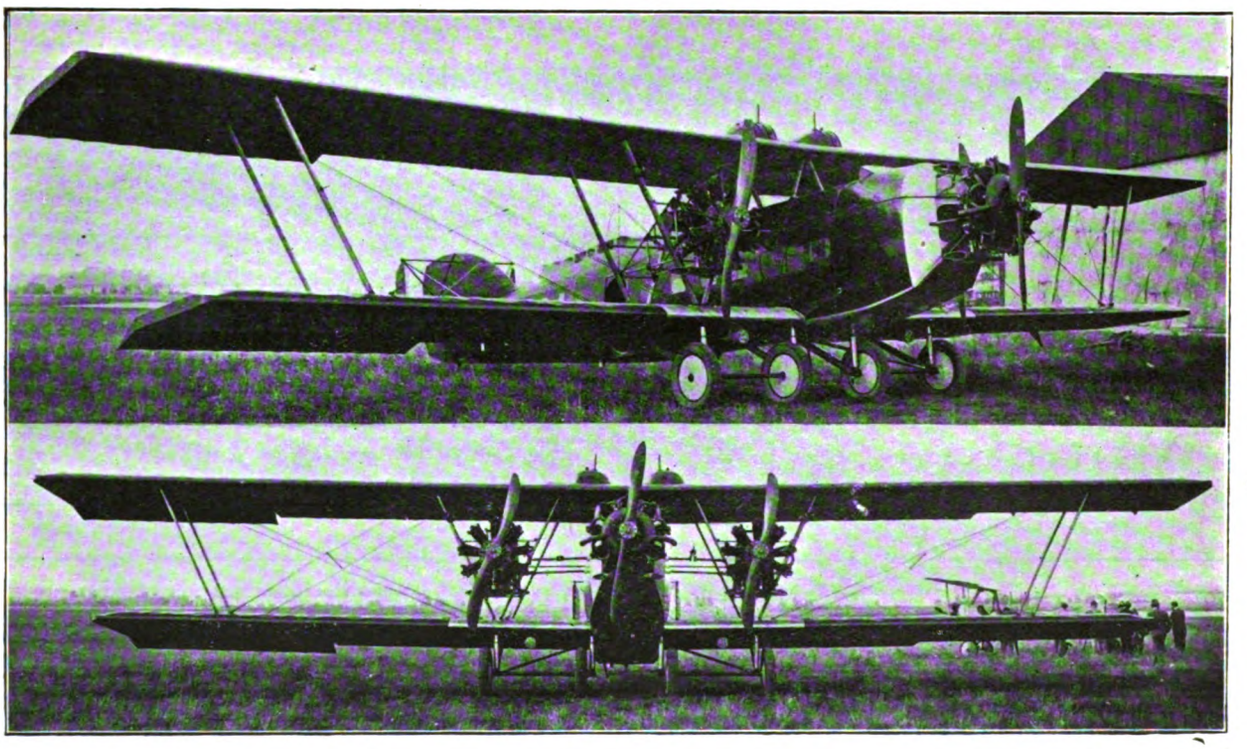
Span	22.0 m. (72. ft 4 in.).
Length	16.05 m. (52 ft. 9 in.).
Height	4.28 m. (14 ft. 1 in.).
Wing area	112 sq. m. (1,204 sq. ft.).
Weight empty	3,200 kgs. (7,040 lbs.).
Passengers and baggage	1,200 kgs. (2,640 lbs.).
Fuel	700 kgs. (1,540 lbs.).
Weight loaded	5,400 kgs. (11,880 lbs.).
Engines	3 "Jupiter," 380 h.p. each.
Wing loading	48.5 kgs./sq. m. (9.9 lbs./sq. ft.).
Power loading	4.75 kgs./h.p. (10.4 lbs./h.p.).
Max. speed	200 km.h. (124 m.p.h.).

THE POTEZ TYPE XVIII.

A three-engine transport machine derived from the Type X previously described. It is designed to carry twelve passengers in a cabin which scarcely seems to be large enough to secure a reasonable degree of comfort on any but the shortest of flights.

The wings are of a very thick section, and are of equal chord. Only one row of struts is fitted on each side of the wing engine struts. The undercarriage consists of two more or less normal Vee undercarriages each with one leg under a wing engine and one under the edge of the fuselage. The rear leg of each set of Vees is telescopic and contains shock-absorbers of the Blackburn compressed rubber type.

The machine is of mixed wood and duralumin construction. The wings are of timber, fabric-covered. The cabin part of the fuselage is of wood with three-ply sides. The nose of the fuselage carrying the engine and the after part of the fuselage are duralumin framed.



The Potez Type XXII.

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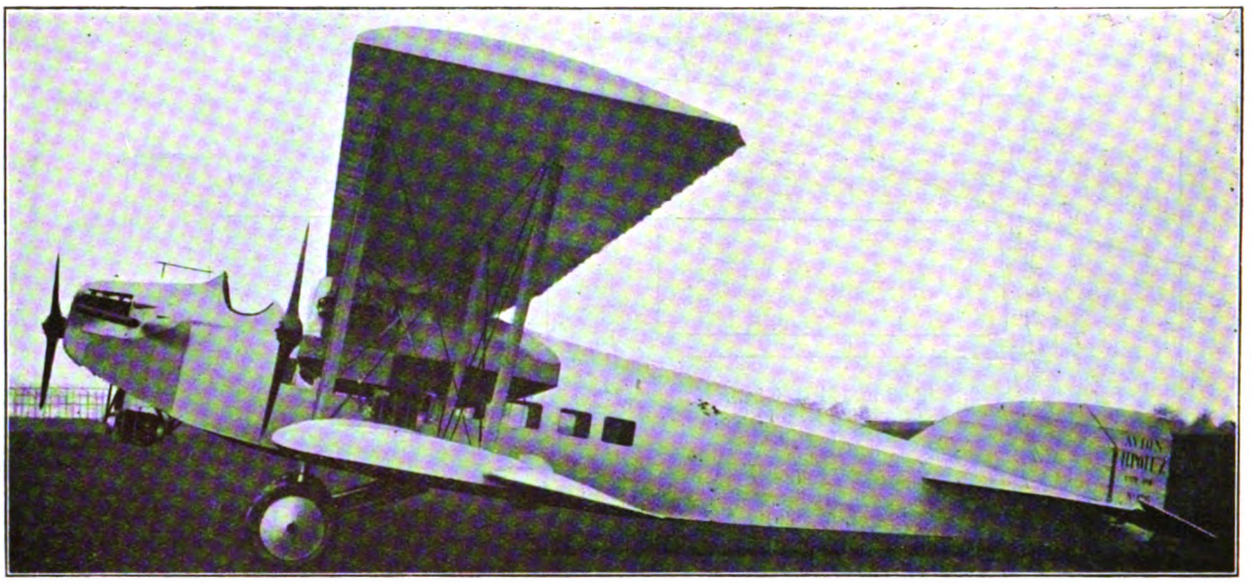
POTEZ—*continued.*



The Potez Type XVIII.

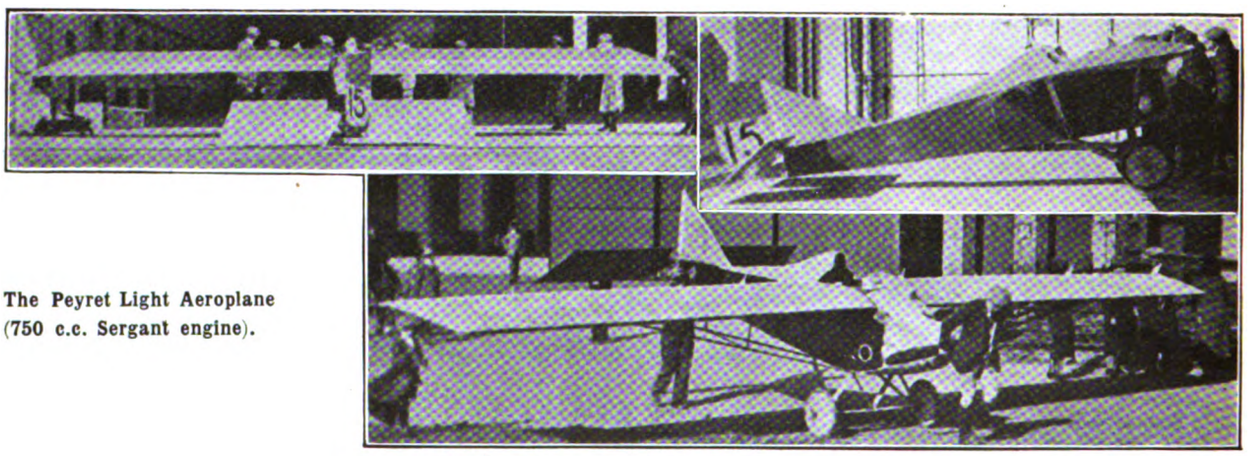
Specification of the Potez Type XVIII.

Type	Three-engine 12-seater Transport Machine.
Span	22 m. 00 (72 ft. 4 in.).
Length overall	14 m. 80 (48 ft. 10 in.).
Height overall	4 m. 00 (13 ft. 1½ in.).
Chord	2 m. 80 (9 ft. 2 in.).
Total wing area	112 sq. m. (1,204 sq. ft.)
Weight empty	2,000 kgs. (6,380 lbs.).
Weight of fuel	675 kgs. (1,490 lbs.).
Crew and passengers, etc.	1,000 kgs. (2,200 lbs.).
Total weight	4,575 kgs. (11,170 lbs.).
Engines	3 Lorraine, 250 h.p. each.
Wing loading	42.5 kgs./m². (8.6 lbs./sq. ft.).
Power loading	6.3 kgs./h.p. (13.6 lbs./h.p.).
Speed (sea level)	195 km.h.
Ceiling	5,000 m. (16,400 ft.).
Radius of action	600 km. (383 miles).

PEYRET.

Louis Peyret. Courtevoie.

M. Peyret constructed for the 1922 French glider meeting a tandem monoplane, which afterwards won the Daily Mail £1,000 prize at the Ilford meeting. In 1923, he produced a light aeroplane, which performed exceedingly well at the French meeting at Vauville, and later appeared at the British meeting at Lympne. The machine unfortunately broke in the air descending from an altitude flight on the last day of the meeting.



The Peyret Light Aeroplane (750 c.c. Sergant engine).

R

ROBERT ESNAULT-PELTERIE.

Etablissements d'Aviation. Factories :—

47, Chemin de Croix-Morlon á Saint Alban, 47, Lyon-Monplaisir (Rhone).

37, Rue des Abondances, 37, Boulogne-s/-Seine.

This firm, which was one of the very earliest in the world to take up the construction of aeroplanes for the time being has entirely suspended the making of aircraft.

It is engaged in prosecuting claims for infringement of Aircraft Patents by the French Aircraft Industry during the war, and by British firms since the war.

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S

SALMSON.

Société des Moteurs Salmson, Billancourt, Seine.

Have built various aeroplanes on which to demonstrate the firm's engines.

M. Salmson is a great engineering employer, and has spent a fortune on experimental work with aero-engines and aircraft generally.

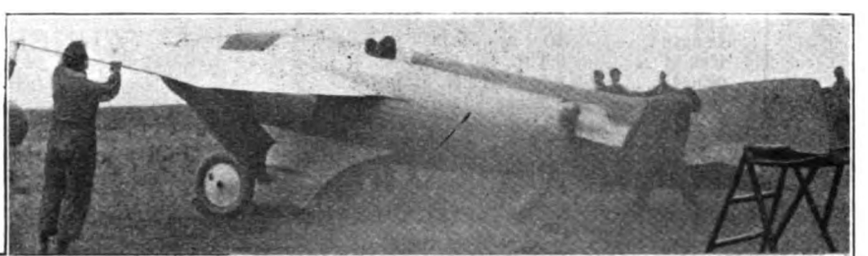
In 1923 the firm built to the design of M. Bechereau, the old Deperdussin designer, a racing machine fitted with a new 500 h.p. Salmson engine. The machine was intended for the abortive Beaumont Cup race, but it is reported that it has not been allowed to fly because the Section Technique have doubts as to the machine's safety. As will be seen, the machine is a rigidly braced monoplane. The construction is mainly of timber, and considerable efforts have been made to cut down head resistance.

The engine is enclosed in a steel casing and is somewhat far behind the airscrew, which is driven by a shaft with an elastic coupling to the engine. By this method, the difficulty of providing a well-shaped fuselage to carry a radial engine is overcome. The engine is cooled by radiators in the leading edge of the wing.

Specification.

Span	**8.16 m. (26 ft. 9 in.).**
Length	**7.92 m. (26 ft.).**
Height	**2.30 m. (7 ft. 6 in.).**
Wing area	**17 sq. m. (183 sq. ft.).**
Weight of aeroplane (without engine)	**600 kgs. (1,320 lbs.).**
Weight of power plant	**750 kgs. (1,650 lbs.).**
Weight loaded	**1,700 kgs. (3,740 lbs.).**
Engine	**500 h.p. Salmson (600 b.h.p.).**
Wing load]	**100 kgs./sq. m. (20.4 lbs./sq. ft.).**
Power loading]	**2.8 kgs./h.p. (6.2 lbs./h.p.)**

The Salmson Bechereau Racing Monoplane.



SCHNEIDER.

Etablissements Schneider, 42 Rue d'Anjou, Paris.

This is the famous French steel firm, which is world-known for its great gun factories at Creusot and for many other engineering activities.

They have been engaged at their works at Le Havre for several years in the construction of a large biplane of the type designated by the French Air Service as B.N.2.

THE SCHNEIDER TYPE "HENRI PAUL."

This machine is a four-engined night bomber, built, except for covering, entirely of steel and of a light alloy. The machine is a biplane carrying two pairs of tandem engines in nacelles on the wings, and the crew and its load of war-like stores in a roomy central fuselage.

There is one undercarriage beneath each engine nacelle, and the tail unit is of biplane type, carried on a central fin. There are three rudders between the tail planes—one following the fin amidships and two other—balanced—in the slipstream.

As is not unusual with large machines of this type, it has been found necessary to sweep back the wings to secure a reasonable balance. In this case the whole of the sweep back is confined to the outer bay and the overhang of the wing, with the result that the wings have a curious dislocated appearance.

As already mentioned, this craft has been under construction for a considerable period and cannot be regarded as an up-to-date example of design. It is one gathers to be regarded rather as an experiment in the art of metal construction of large machines.

The Schneider "Henri Paul" (4 Lorraine engines—370 h.p.).

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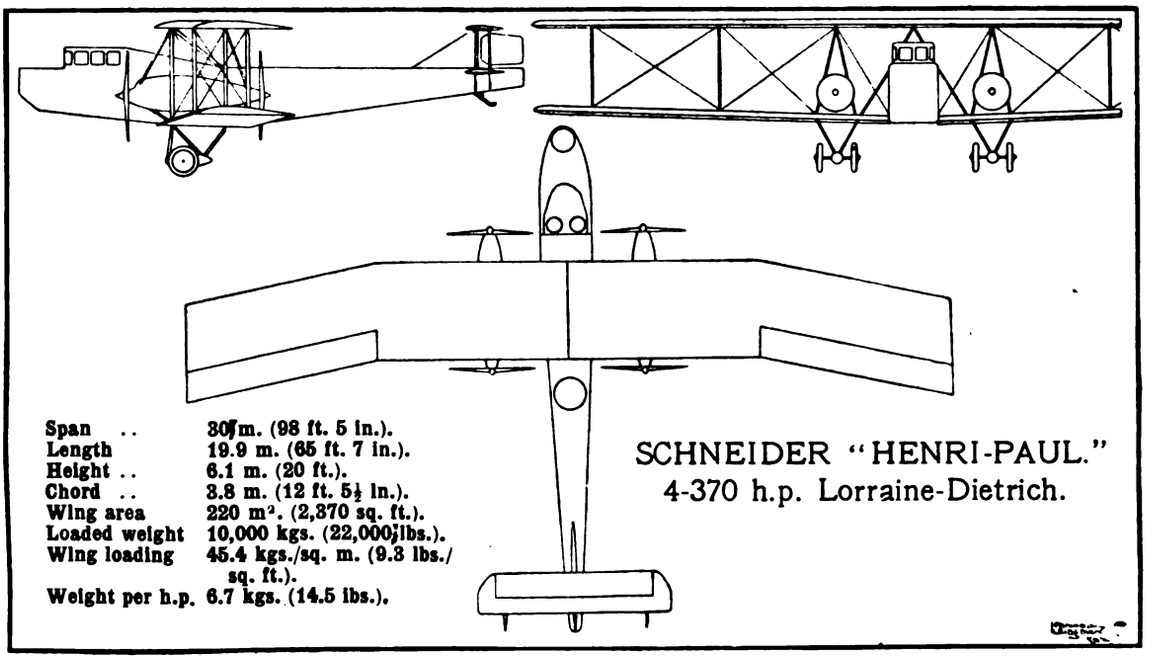
S.E.C.M.



Span ..	30 m. (98 ft. 5 in.).
Length	19.9 m. (65 ft. 7 in.).
Height ..	6.1 m. (20 ft.).
Chord ..	3.8 m. (12 ft. 5½ in.).
Wing area	220 m². (2,370 sq. ft.).
Loaded weight	10,000 kgs. (22,000 lbs.).
Wing loading	45.4 kgs./sq. m. (9.3 lbs./sq. ft.).
Weight per h.p.	6.7 kgs. (14.5 lbs.).

SCHNEIDER "HENRI-PAUL."
4-370 h.p. Lorraine-Dietrich.

Société d'Emboutissage et de Constructions Mecaniquee, 171, Boulevard du Havre, Colombes, Paris.

A firm specializing in light metal stamping and press work. Has developed a system of metal construction.

The firm also undertakes the production of the Lorraine-Dietrich aero-engines.

THE S.E.C.M. TYPE 22.

This machine was entered for the French School machine Tests in 1923, in the advanced training class, and performed extremely well.

The fuselage is constructed of duralumin tubes held together by rather complicated, but quite pretty stampings of sheet duralumin very much riveted up. The wing spars are trellis work with U section flanges and "Zeppelin" type cross-members. The two seats are side by side behind the wings and dual control is fitted.

Specification.

Span	11.20 m. (36 ft. 9 in.).
Wing area	24 sq. m. (258 sq. ft.).
Weight empty	687 kgs. (1,511 lbs.).
Weight loaded	1,007 kgs. (2,215 lbs.).
Engine	Hispano-Suiza, 180 h.p.
Wing loading	44.6 kgs./sq. m. (8.6 lbs./sq. ft.).
Power loading	5.95 kgs./h.p. (12.3 lbs./h.p.).
Max. speed	192 km.h. (118 m.p.h.).
Climb to 3,000 m. (9,840 ft.)	13 mins. 50 secs.

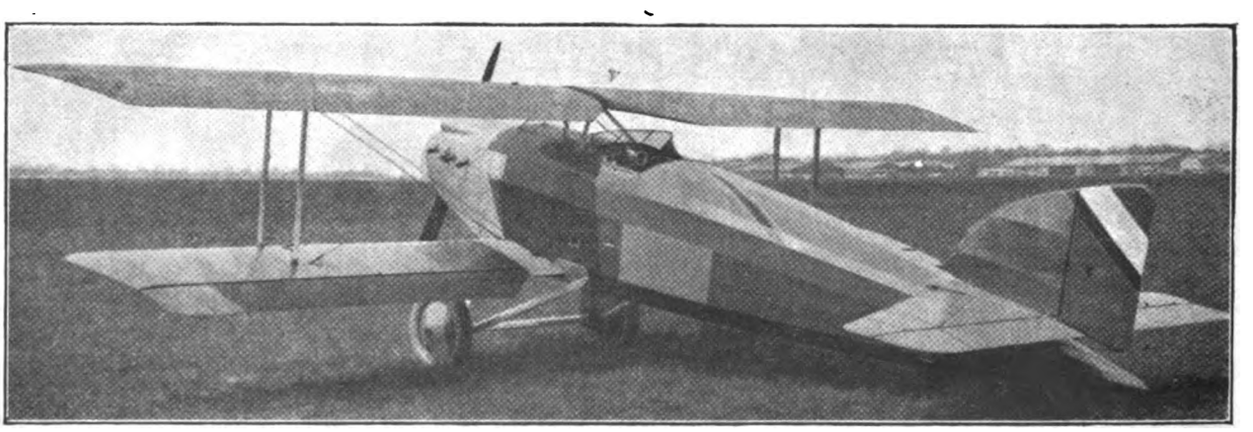
THE S.E.C.M. TYPE 23.

This is a three-seater "de tourisme." The construction is similar to the previously-described types.

The pilot is under the wings and the two passengers are carried behind in a beautifully-upholstered cockpit.

Specification of the S.E.C.M. Type 23.

Span	11.20 m. (36 ft. 9 in.).
Wing area	26 sq. m. (280 sq. ft.).
Weight empty	730 kgs. (1,606 lbs.).
Weight loaded	1,100 kgs. (2,420 lbs.).
Engine	Hispano-Suiza, 180 h.p.
Wing loading	42.4 kgs./sq. m. (8.65 lbs./sq. ft.).
Power loading	6.12 kgs./h.p. (13.4 lbs./h.p.).
Speed at 2,000 m. (6,560 ft.)	175 km.h. (108 m.p.h.).
Landing speed	65 km.h. (41 m.p.h.).
Service ceiling	4,500 m. (14,750 ft.).



The S.E.C.M. type 22 Training Machines (180 h.p. Hispano-Suiza engine).

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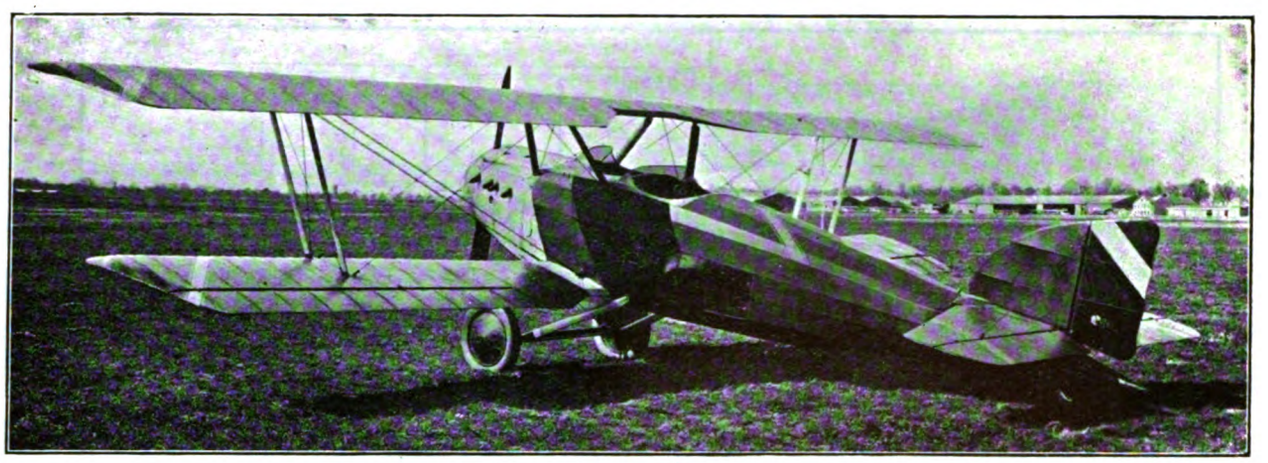
S.E.C.M.—*continued.*



The S.E.C.M. Type 23 Three Seater (180 Hispano-Suiza).

THE S.E.C.M. TYPE 24.

A preliminary training machine of typical S.E.C.M. construction fitted with an 80 h.p. Le Rhône engine. It is of the tandem two-seater type with full dual control.

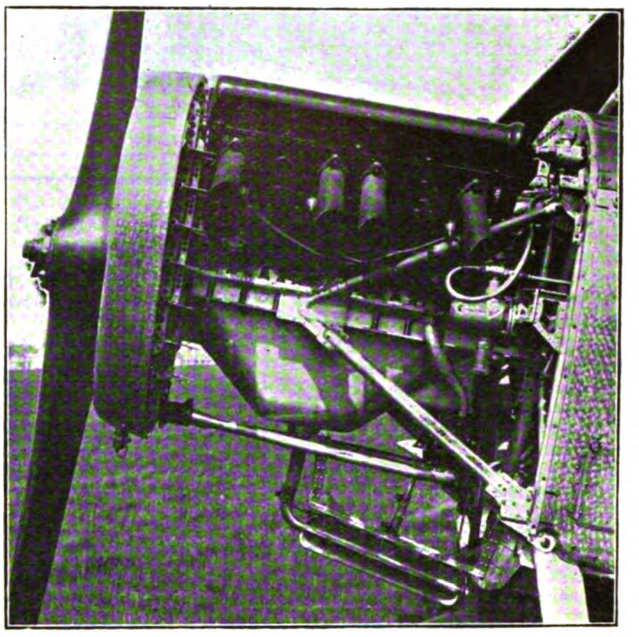
Specification.

Span	**11.20 m. (36 ft. 9 in.).**
Wing area	**26 sq. m. (280 sq. ft.).**
Weight empty	**500 kgs. (1,100 lbs.).**
Weight loaded	**750 kgs. (1,650 lbs.).**
Engine	**Le Rhone, 80 h.p.**
Wing loading	**28.8 kgs./sq. m. (5.9 lbs./sq. ft.).**
Power loading	**9.4 kgs./h.p. (20.6 lbs./h.p.).**
Max. speed	**135 km.h. (84 m.p.h.)**
Climb to 2,000 m. (6,560 ft.)	**12 mins.**

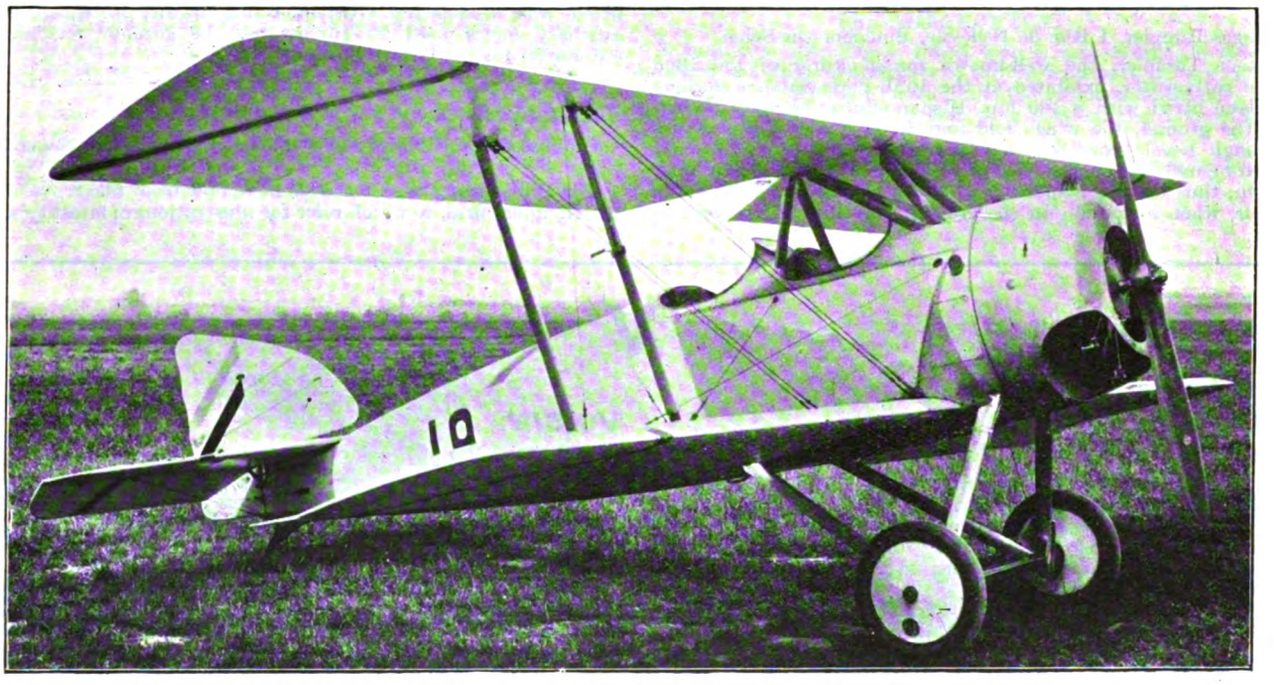
THE S.E.C.M. NIGHT-BOMBER.

This is another machine having the same constructional features as the previous machine. It is an equal winged biplane, slightly staggered, fitted with very large balanced ailerons, elevators and rudder.

The fuselage is rectangular, and of sufficient cross-section to contain entirely the 500 h.p. radial engine. To add to what one may aptly call the " encombrement " of this part of the machine a pair of enormous side radiators are fitted to it ahead of the wing, with the result that the pilot, whose seat is offset to the port side of the fuselage, can see nothing below the top of fuselage which is less than 15° to port of his line of flight. Presumably as the machine is to fly at night when he will be unable to see anything, this is relatively unimportant.



Engine mounting of the S.E.C.M. 22 and 23.



The S.E.C.M. Type 24 School Machine (80 Le Rhone).

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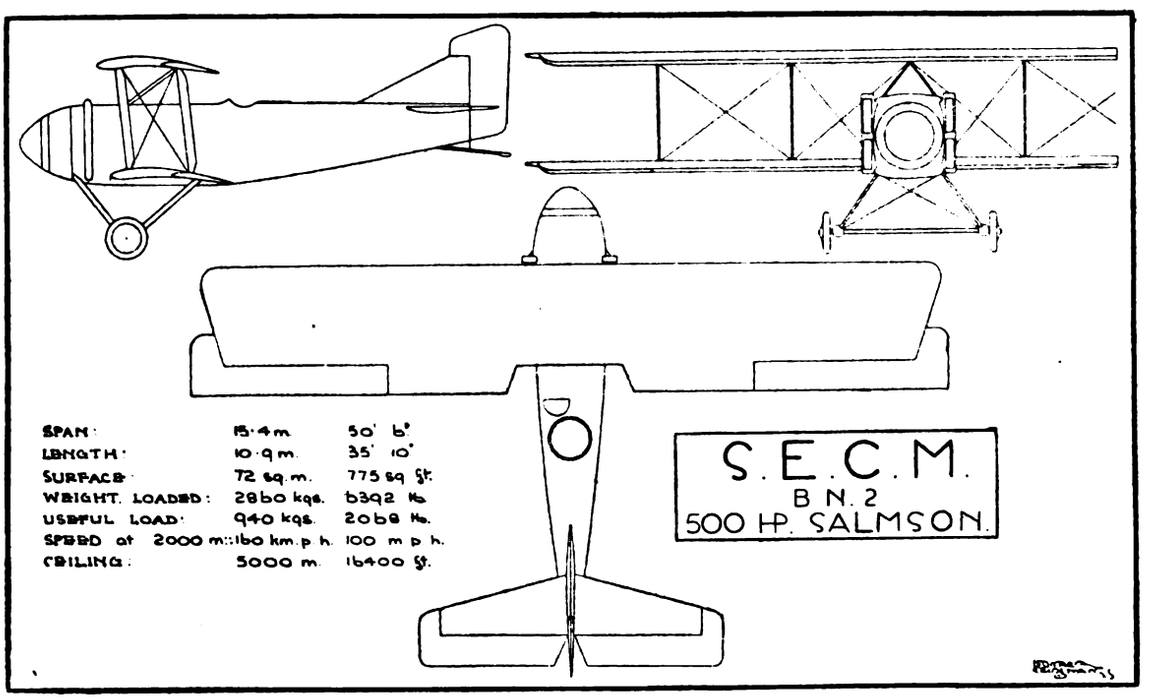
S.E.C.M.—*continued.*


SPAN: 15·4 m. 50' 6"
LENGTH: 10·9 m. 35' 10"
SURFACE: 72 sq. m. 775 sq ft.
WEIGHT. LOADED: 2860 kgs. 6392 lb.
USEFUL LOAD: 940 kgs. 2068 lb.
SPEED at 2000 m: 180 km. p h. 100 m p h.
CEILING: 5000 m. 16400 ft.
S.E.C.M.
B N. 2
500 HP. SALMSON.

LA SOCIÉTÉ DES AVIONS SIMPLEX.

The Simplex aircraft are of the tail-less type developed by a M. Arnoux, and a monoplane was entered by this firm in the 1922 Coupe Deutsch.

The wing was in one piece, of thick section and symmetrical, following the form of No. 411 of Herr Prandtl. The two main wing spars are of spruce, with poplar ply sides. The ribs are of poplar.

The elevator and aileron control is on the differential principle, forward motion of the joy stick putting both wing-flaps down, whereas side motion operates the flaps as ailerons.

The type has not so far shown itself to be practicable.

SPAD.

The Spad (Société Pour Aviation et ses Dérivés) is the old Deperdussin firm, founded in 1910, and revived in the first year of war by a company, at the head of which is M. Blériot.

The firm is now combined with Blériot Aeronautique, and trades under that name.

Spad aircraft will be found under the heading Blériot.

T

TAMPIER.

René Tampier, 1 Rue de Bellevue, Boulogne-sur-Seine.

René Tampier, the well-known manufacturer of the Bloc tube carburetter, exhibited at the 1921 Paris Salon a curious biplane fitted with a 180 h.p. Hispano-Suiza engine. When on the ground, the wings fold and an auxiliary motor drives through bevel gears the undercarriage wheels, an additional form of undercarriage normally stowed in the fuselage, folding down, thus making a species of "*avion-automobile*," the whole affair, when in motion on the ground, travelling in the reverse direction, that is, tail first. A 1922 version was produced, fitted with a 300 h.p. Hispano-Suiza engine, in which the auxiliary motor used for running on the ground, acts as a self-starter for the Hispano-Suiza.

TELLIER.

Etablissements Tellier, Quai de Seine, Argenteuil, Seine et Oise.

The Tellier flying boat interests have now been taken over by the Nieuport firm, to which refer for illustrations of latest types.

V

VINOT.

Société des Anciens Ateliers Vinot et Deguingand, 59, Avenue Georges Clemençeau, Nanteuil, Paris.

The firm of Vinot et Deguingand, one of the oldest of French automobile manufacturers, have recently taken up the construction of aircraft and are building to the order of the French Government. They have also done all the constructional work of the Pescara helicopter.

VOISIN.

Aeroplanes Voisin, Boulevard Gambetta, Issy-les-Moulineaux, (Seine).

Associated with the Etablissements Ch. Lefevre & Cie. Société Anonyme, with capital of 3,000,000 francs.

Paris Office: 105, Rue St. Lazare, Paris.

The oldest aeroplane firm in the world, founded by the Brothers Voisin, in 1905.

Have produced no aircraft since those described in the 1919 Edition of "All the World's Aircraft," and are now engaged in the automobile industry.

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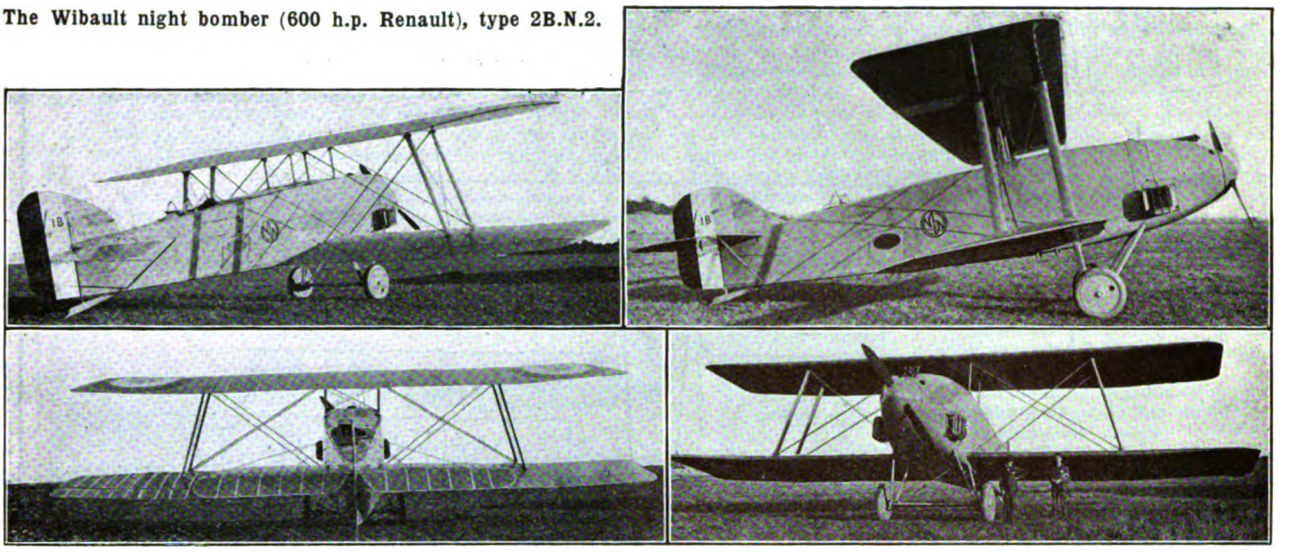
WIBAULT.

W

The Wibault night bomber (600 h.p. Renault), type 2B.N.2.



Avions Michel Wibault, 17, Place Felix Faure, Paris (XVI).

M. Michel Wibault, at the outbreak of war, was living in Lille and was in that town when it was occupied by the German forces. He, being a cripple, was not deported to Germany, and was allowed a considerable degree of freedom, which he occupied by building a small wind tunnel in an attic, and by experimenting therein. During 1917, he succeeded in crossing the lines into French territory, and embarked on a course of aircraft design. His first product, a single-seat fighter, was produced just too late for the War, but on official tests put up an extraordinarily fine performance.

He has since been responsible for the design of a number of extremely important aircraft.

THE WIBAULT 2B.N.2.

A large single-engined bomber. The noteworthy features are the thick section wings, tapering considerably towards the tip, which are the result of M. Wibault's aerodynamic researches, and all-metal construction. French all-metal construction is in general notable for the extreme disregard for cost shown in its inception, but on this machine very considerable attention has been paid to simplicity of construction.

In the wings, the thick section referred to allows for deep spars, and in this machine these are simple boxes, built of heavy gauge duralumin sheet, flanged and rivetted together with a relatively small number of reasonable-sized rivets. The ribs are of duralumin tube, top and bottom flanges united by a "Warren" type bracing. All the rib structures and the leading and trailing edges are of the one diameter and gauge of tube.

The photographs which are here reproduced, show the machine to be distinctly interesting, quite apart from the details of its wing construction.

The most noticeable features are that the machine is of the single bay type, and that it has a greater span on the lower wing than on the upper. It may be assumed that this is in order to permit the use of uniform wing spars on both wings.

The machine was built to the designs of M. Wibault for Avions Michel Wibault, by M. Pierre Levasseur, and like all M. Levasseur's products is of the very best workmanship throughout.

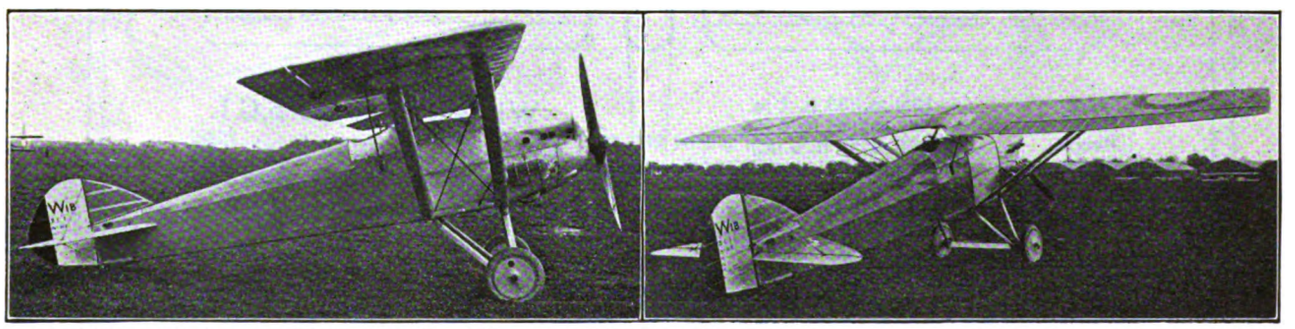
Specification of the Wibault B.N.2.

Span (top)	**15.2 m. (49 ft. 10 in.).**
Span (bottom)	**16.9 m. (55 ft. 5 in.).**
Length overall	**12.75 m. (41 ft. 9 in.).**
Height overall	**5 m. (16 ft. 5 in.).**
Area of wings	**100 sq. m. (1,072 sq. ft.).**
Engine	**600 h.p. Renault.**
Weight empty (with water)	**2,160 kgs. (4,760 lbs.).**
Weight loaded	**4,500 kgs. (9,900 lbs.).**
Wing loading	**45 kgs. m². (9.25 lbs./sq. ft.).**
Weight per h.p.	**7.5 kgs. (16.5 lbs./h.p.).**
Speed at 2,000 m. (6,500 ft.)	200 km.p.h. (125 m.p.h.).
Ceiling	5,000 m. (16,340 ft.).

THE WIBAULT 3C.1.

A cantilever monoplane, fitted with a supercharged engine, designed as a single-seat fighter or for the transport at very high speeds of relatively light loads. Like the previous machine, it is fitted with M. Wibault's special wing section, and is entirely built of metal.

This machine is shown in the drawing and photographs here reproduced.



The Wibault single-seat Fighter (300 h.p. Hispano Suiza engine).

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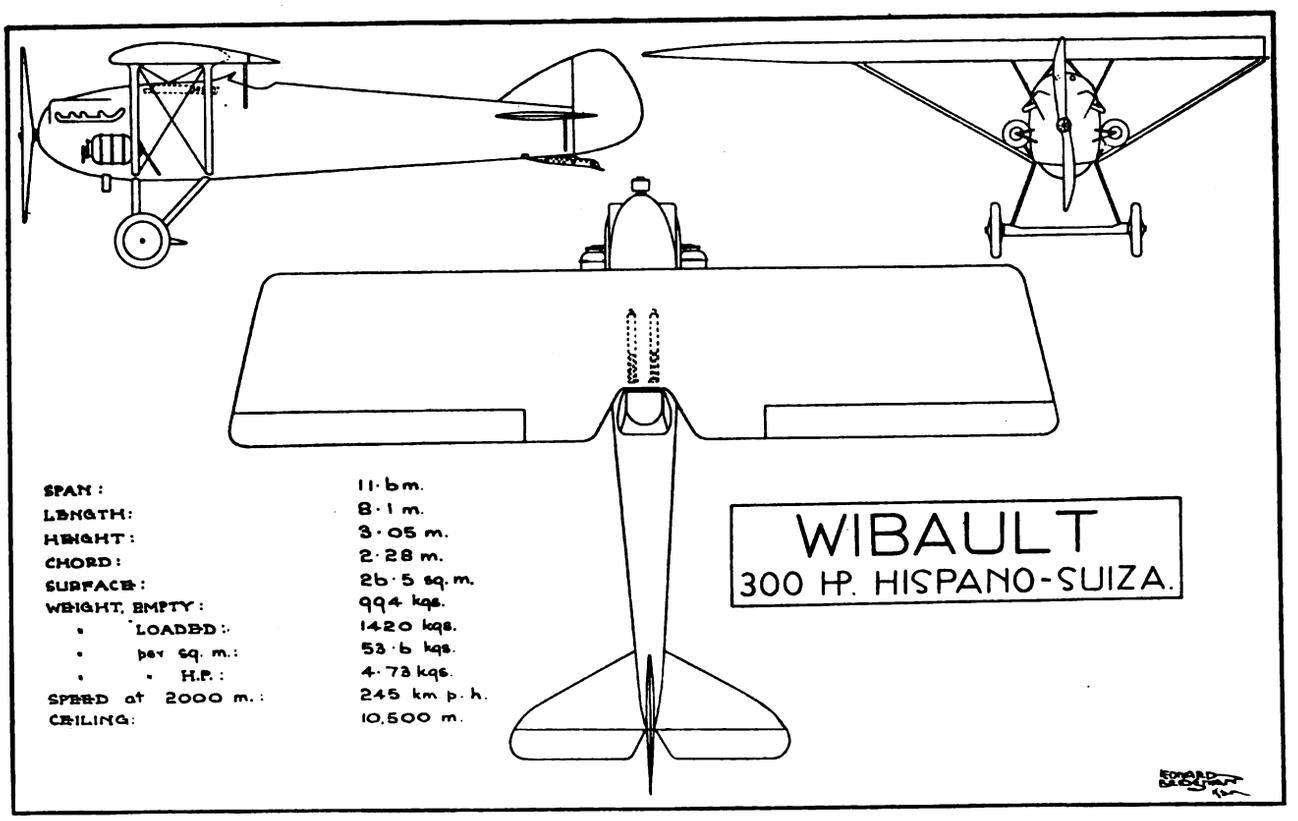
WIBAULT*—*continued.



THE WIBAULT 5C1.

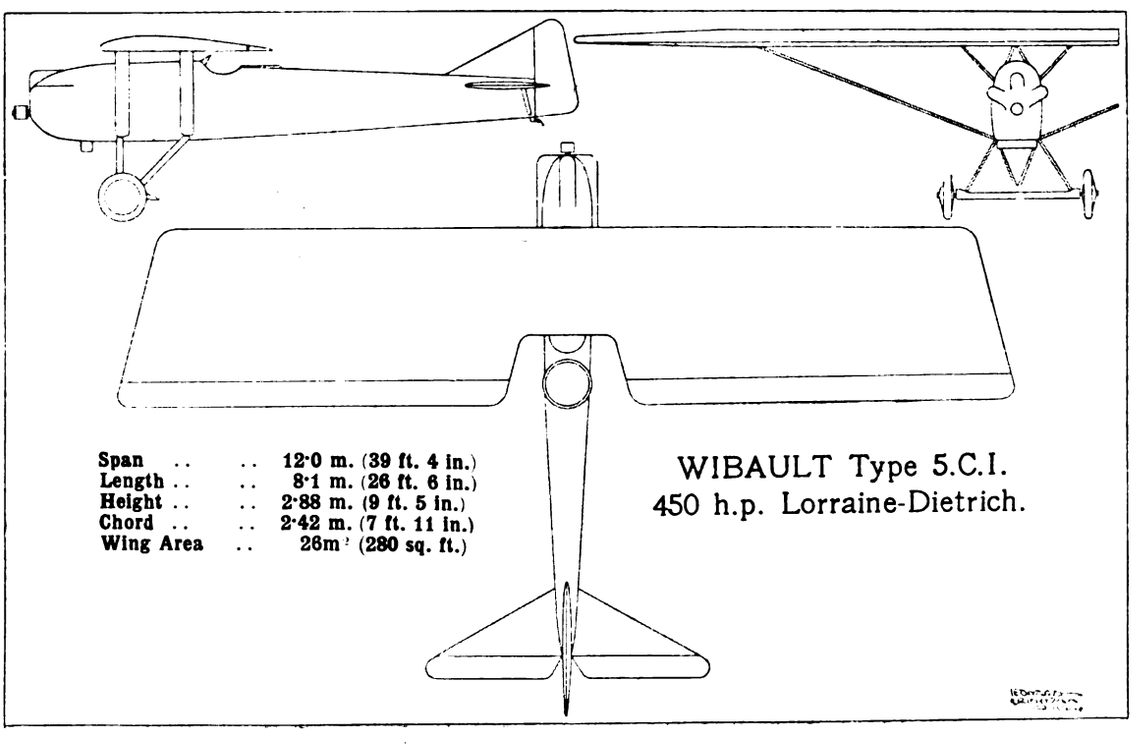
This machine which follows the lines of previously described monoplane in general arrangement is now being produced for the French Section Technique. No data other than those given on the scale drawing are available.

Z

ZODIAC.

Société Zodiac, 15, Avenue du Havre, Puteaux (Seine).

The Société Zodiac, well-known as constructors of airships and of aeroplanes in the very early days, are known to be again constructing heavier-than-air craft to the order of the French Government, but no particulars as to the types are available.


Span .. .. 12·0 m. (39 ft. 4 in.)
Length .. .. 8·1 m. (26 ft. 6 in.)
Height .. .. 2·88 m. (9 ft. 5 in.)
Chord .. .. 2·42 m. (7 ft. 11 in.)
Wing Area .. 26m² (280 sq. ft.)
WIBAULT Type 5.C.I.
450 h.p. Lorraine-Dietrich.

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GERMANY.

A

AACHEN.

Aachener Segelflugzeugbau, G.m.b.H., Aachen.

Founded in 1921 as a result of the success of the Klemperer soaring monoplane of 1920. Managing Director: Dipl. Ing. P. Stock. Dipl. Ing. W. Klemperer is the responsible designer and Proff. Th. von Karman is associated in a technical capacity.

The firm built soaring monoplanes (gliders) of the type flown by Klemperer at the 1920 and 1921 meetings at the Rhön, an experimental "Canard" type machine, and at the end of 1922 a glider known as the Klemperer "Rhenania" or "K.E." type (which is illustrated in the glider section of this volume).

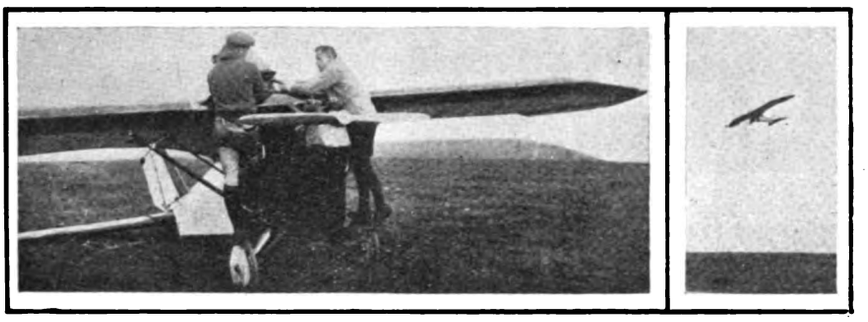
In 1923 the firm built a light aeroplane, also to the designs of Dipl. Ing. Klemperer, which somewhat resembles the last-mentioned type of glider and is known as the type "K.F."

THE AACHEN "K.F." LIGHT AEROPLANE.

A thick wing monoplane with a rigidly braced centre section, below which the pilot sits. The outer sections of the wings are entirely cantilever structures and they have considerably swept-back tips.

The fuselage is of rectangular section with a Vee-shaped top which serves to support the centre section. The pilot's cockpit is cut out of this. The undercarriage consists of two streamline "trousers" projecting outwards from the bottom of the fuselage and carrying wheels which are sprung inside the trouser legs.

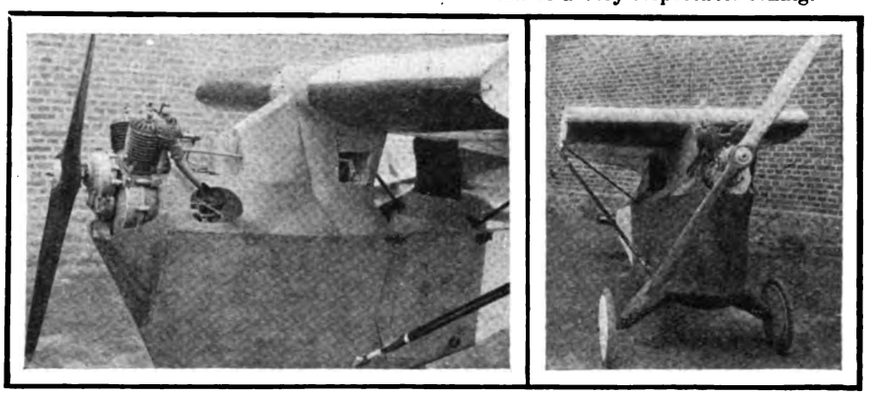
The fin and rudder have a curious appearance when the machine is at rest on the ground, as the hinge line is markedly raked backwards from the vertical.



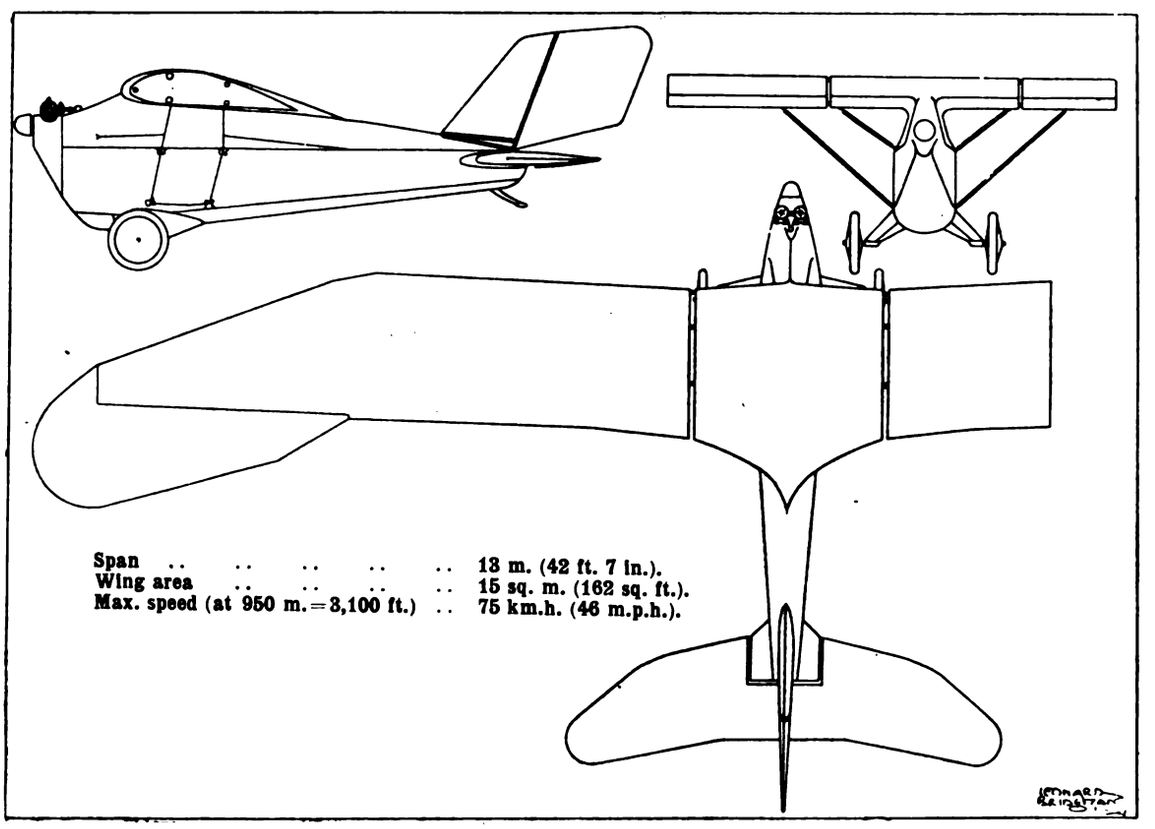
The engine is a 2-cylinder Vee "Mabeco" motor cycle engine, built by Siemens and Halske, and fitted with a special reduction gear. It is nominally of 8 h.p.

The machine is built very much as was the case with the earlier gliders of Klemperer design, using large numbers of light spruce members carried on three-ply formers.

The machine was tested at the Wasserkuppe at an altitude above sea level of 950 m. (3,100 ft.), where it got off the ground easily and showed an initial climb rate of 60 m. (200 ft.) per min., which would indicate the possession of a very respectable ceiling.



The Aachen K.F. Light Aeroplane.



Span	**13 m. (42 ft. 7 in.).**
Wing area	**15 sq. m. (162 sq. ft.).**
Max. speed (at 950 m. = 3,100 ft.) ..	**75 km.h. (46 m.p.h.).**

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A.E.G.

Allgemeine Elektricitäts Gesellschaft, Hennigsdorf bei Berlin.

This big engineering firm formed an aircraft branch at Hennigsdorf by Berlin, in 1913.

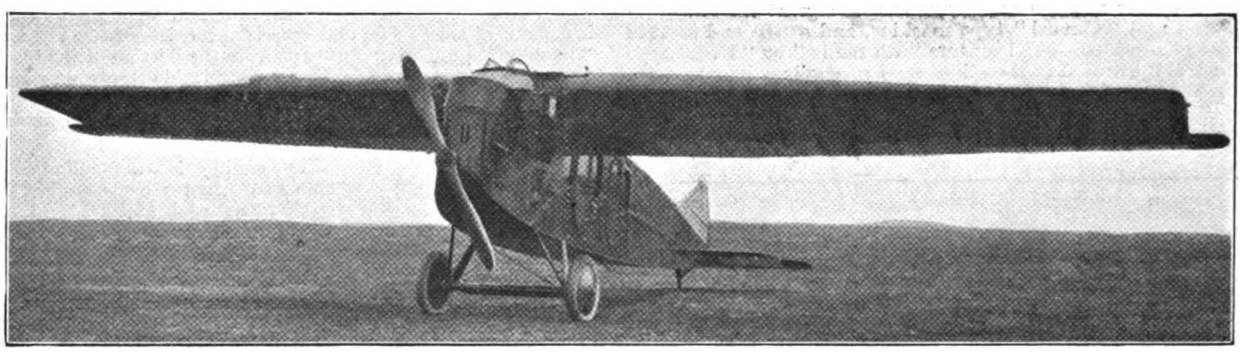
The A.E.G. concern holds a position of financial strength in Germany similar, for instance, to that of Vickers, Ltd., in Britain.

After the outbreak of war, the A.E.G. took over the Flugzeugwerke G.m.b.H., formerly Ago-Werke.

During the war a large number of school, reconnaissance, contour fighting and twin-engined bombing machines were built by the A.E.G. A small number of single-seat fighters were also made. These war-time A.E.G'S have been described in earlier issues of "All the World's Aircraft."

After the revolution, a certain number of ancient A.E.G. war types, fitted with cabins, were used for civil air transport by the Deutsche Luft Reederei—in which concern the A.E.G. is financially interested.

No aircraft work has been carried out since the end of 1920.



The Albatros L 58.

ALBATROS.

Albatros-Werke A.G. : Berlin-Johannistal.

Chief Designer : Dipl. Ing. Schubert.

This firm was originally the Albatros Gesellschaft fur Flugzeugunternehmungen, later Albatros G.m.b.H. A new company with the title given above was formed in 1923.

One of Germany's most important aircraft works, established 1910 by building "box bite" biplanes and Gnôme-engined Antoinette monoplanes by license.

In 1911 a biplane of "Taube" outlines was produced, a graceful machine, exhibited at the French aero show of the year. It was one of the first examples of employing rigid triangulated wing bracing.

A "Taube" amphibian (combined wheel and two-float chassis) was very successful at the Boden See, and gained first place in the Italian seaplane circuit 1913. A two-float Albatros box kite performed well at the first German seaplane competition (Heiligendamm, 1912).

In 1912, Albatros tractor biplanes were produced. With these machines the 1914 duration performances of Landmann and Boehm (21 hours and 24 hours) were accomplished. Albatros tractor biplanes were extremely successful at the 1913 Monaco and Vienna meetings.

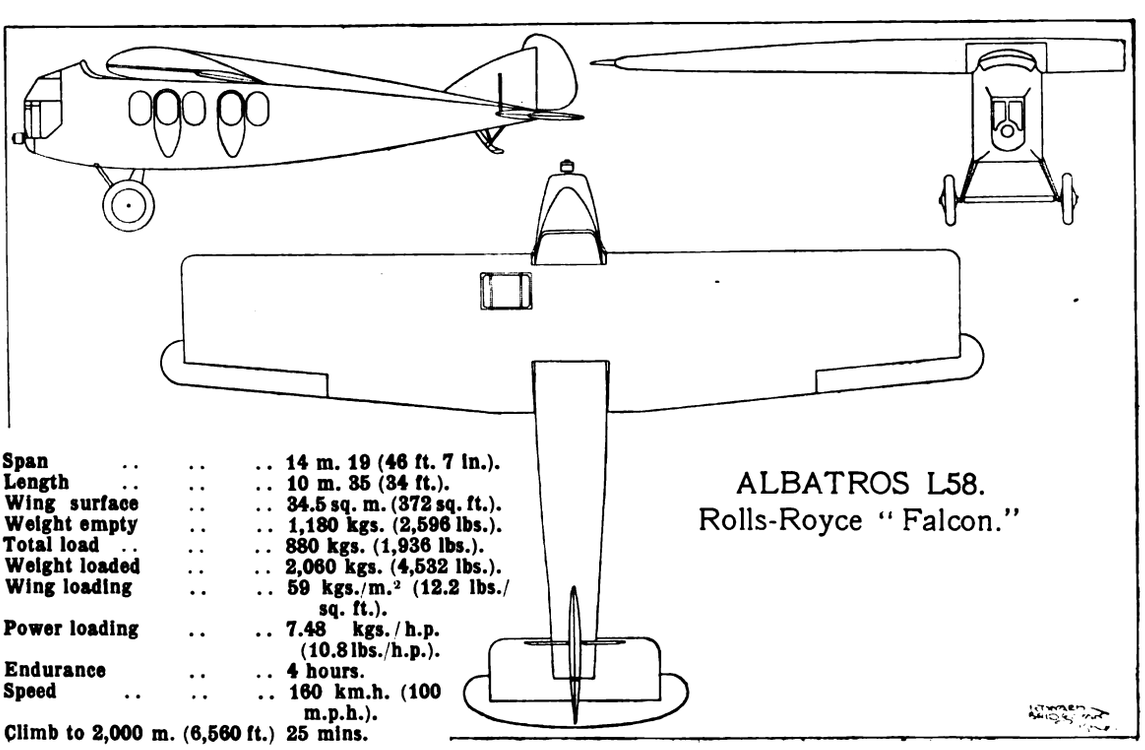
During the war the Albatros firm built quite a large number of aeroplanes and seaplanes of every kind—single-seaters, two-seaters, bombing biplanes, school biplanes, Staaken giant biplanes, armoured infantry biplanes, etc.—of which the better known types have already been dealt with in earlier issues of this work.

After the war designs of the "W.10" monoplane flying-boat reminiscent of the Dornier flying-boats, but of wooden construction, and the "L.57" six-seater (1919-20) were made. Owing to the restrictions of the Commission Aeronautique Interalliee during 1919-22 it was not possible to finish these machines.

During 1922, a six-seater "L.58" cantilever monoplane was built. This machine went into production 1923 and is in service on certain German and Russian air lines.

THE ALBATROS L58.

The machine shown in the attached photograph is a modification of the Albatros L.57, a scale drawing of which was published in the previous volume. The L.57 was never completed, having been forbidden by the Commission Aéronautique Inter-Alliée. In the present machine a "Falcon" Rolls-Royce engine of 240 h.p. has been installed. The machine is a six-passenger cantilever monoplane built of wood and three-ply covered. The wing, which has a maximum thickness at the roots of 0.6 m. (2 ft.) is built in three sections, a centre section and extensions. Large ailerons with a balancing projection are fitted.



ALBATROS L58.
Rolls-Royce "Falcon."

Span	**14 m. 19 (46 ft. 7 in.).**
Length	**10 m. 35 (34 ft.).**
Wing surface	**34.5 sq. m. (372 sq. ft.).**
Weight empty	**1,180 kgs. (2,596 lbs.).**
Total load	**880 kgs. (1,936 lbs.).**
Weight loaded	**2,060 kgs. (4,532 lbs.).**
Wing loading	**59 kgs./m.² (12.2 lbs./sq. ft.).**
Power loading	**7.48 kgs./h.p. (10.8 lbs./h.p.).**
Endurance	**4 hours.**
Speed	**160 km.h. (100 m.p.h.).**
Climb to 2,000 m. (6,560 ft.)	**25 mins.**

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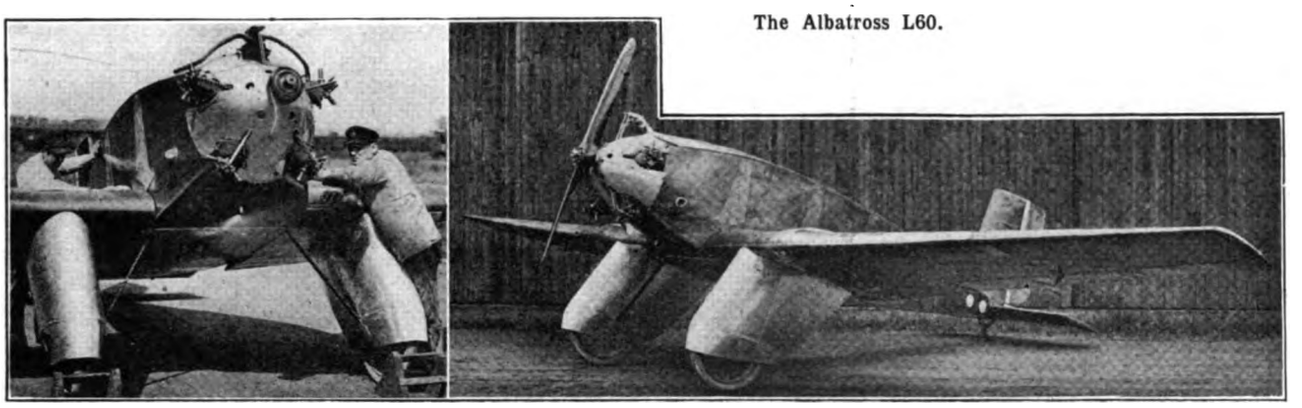
ALBATROS—*continued.*



The Albatross L60.

The cabin is arranged to be almost entirely under the wing, thus keeping the passenger load close to the C.G. and in consequence the machine is in good trim with all loads.

The pilot is seated just ahead of the leading edge, with his feet extending forward over the engine, which is very completely enclosed. Petrol tanks and luggage are carried in the wing.

THE ALBATROS L59 & L60.

The Albatros firm produced in 1923 a pair of small monoplanes known as the L.59 and L.60 respectively. These two machines are identical except that the L.59 is a single-seater with a 55 h.p. Siemens-Halske radial engine and the L.60 is a two-seater with the larger 70/80 h.p. engine of the same type and make.

These machines are thick-winged cantilever monoplanes with the wing at the bottom of the fuselage, in the manner made popular by Dr. Junkers and since followed by many other designers. The central section of the wing is built into the fuselage and carries at each extremity one leg of the undercarriage. Each of these legs is enclosed in a streamline "trouser" which is further supported by a strut running from the axle to the bottom of the fuselage.

The wings taper continuously both in chord and in thickness from roots to tips and have a mean aspect ratio of 8.5. The wing has a dihedral on the top surface of 3°.

The ailerons, elevator and rudder are all of notably high aspect ratio, and the fin and rudder are of remarkably large dimensions.

The machine is fairly obviously a case of the application of gliding and soaring experience to the design of a moderate-powered aeroplane.

The machine shown in the scale drawing here reproduced is the L.60 two-seater. The front seat is that for the pilot, the passenger seat—which is suppressed in the L.59—being to the right and behind that of the pilot.

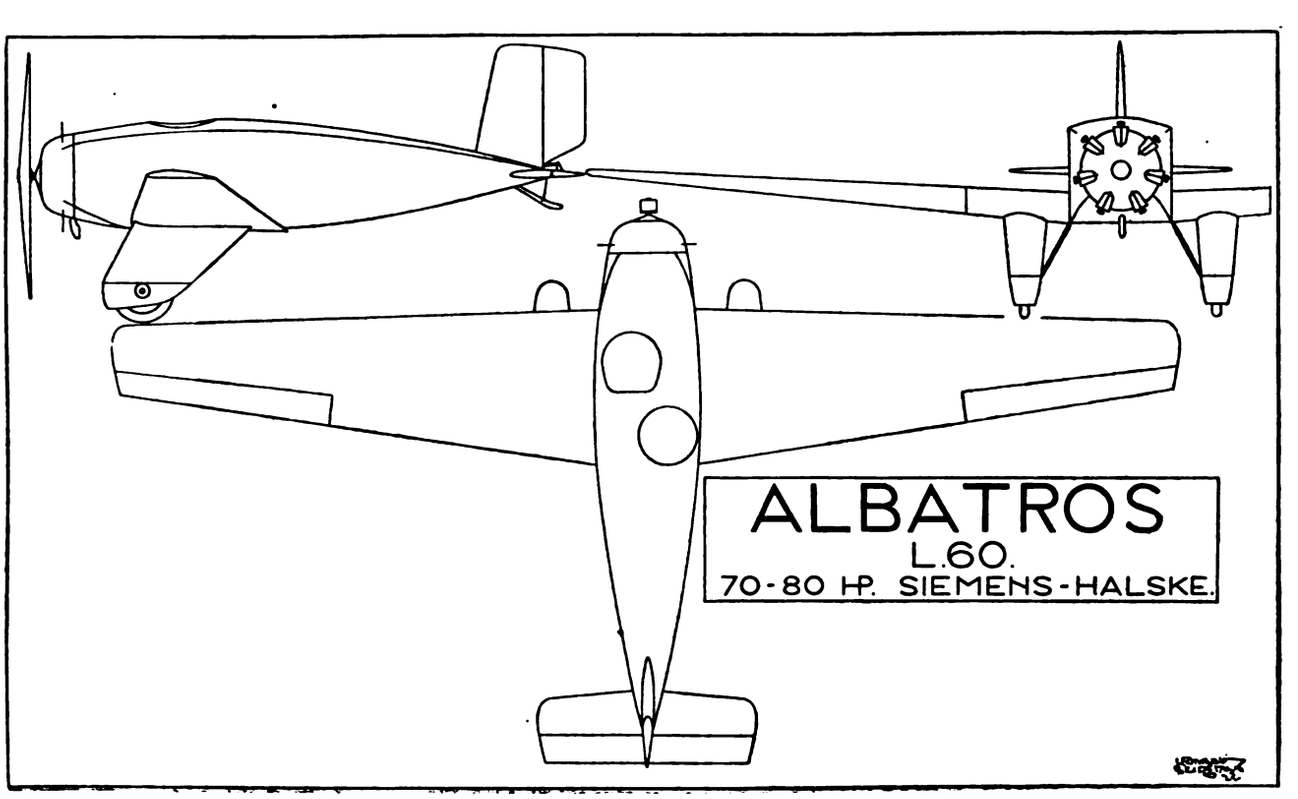
Fuel for 3½ hours' flight is carried in a tank below the pilot's seat.

The overall dimensions of the L.59 are the same as those of the L.60, and are given on the drawing. The following table gives the weights and performance figures for the two types :—

Specifications of the L.59 and L.60.

	L.59.	L.60.
Weight empty	348 kgs. (766 lbs.).	368 kgs. (810 lbs.).
Weight loaded	480 kgs. (1,056 lbs.).	600 kgs. (1,320 lbs.).
Speed at 1,000 m. (3,280 ft.)	140 km.h. (87 m.p.h.).	145 km.h. (90 m.p.h.).
Climb to 1,000 m. (3,280 ft.)	9 mins.	8 mins.
Wing loading	48 kgs./sq. m. (10 lbs./sq. ft.).	60 kgs./sq. m. (12.2 lbs./sq. ft.).
Power loading	9 kgs./h.p. (20 lbs./h.p.).	8 kgs./h.p. (17.5 lbs./h.p.

A twin-engined commercial machine has also been designed, but may not be built under the regulations imposed by the Inter-Allied Commission of Control.



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ALBATROS—*continued.*

THE ALBATROSS L66.

A machine of the light aeroplane type designed for school and sports purposes. Can be made as a single or two-seater. In the latter case dual control can be fitted.

The fuselage is of steel tube, wire braced and fabric covered, the wings of wood, also fabric covered. The wing is carried well above the fuselage, the crew sitting beneath it.

The engine is a two-cylinder opposed type of 30/40 h.p., and the machine carries fuel for three hours.

Specification of the L66.

Wing area	**13.5 m.² (146 sq. ft.).**
Weight empty	**220 kg. (484 lbs.).**
Weight loaded*	**395 kg. (870 lbs.).**
Wing loading	**29.3 kg./m.² (59 lbs./89 ft.)**
Power loading	**12 kg./h.p. (26.4 lbs./h.p.).**
Speed	**100 km.h. (62 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**15 mins.**

* Includes crew (2) and 3 hours' fuel.

The Albatros Light Aeroplane L.66.

AVIATIK.

The Automobil and Aviatik A.G. of Leipzig, Heiterblick, was formed in 1910, by Georg Chatel and Emil Jeannin, to sell motor cars and build Farman box-kite type biplanes and Hanriot monoplanes by license.

When the 1913 tractor arrow biplane was produced, fine performances were achieved by Ingold with a 16 hours' flight, and by Stoeffler in various distance flights across Germany, foremost his record of 2,100 km. in 24 hours, in September, 1913.

"Aviatik" aircraft were extremely widely used during the war. The war-time Aviatiks, and certain peace-time variants, have been described in earlier volumes.

The original firm went into liquidation and ceased to exist in 1922. A new firm, known as "Automobilwerke Heiterblick A.G.," formed to take over the concern, is also in liquidation, and all rights and properties in the Aviatik concern are in the hands of the "J. Mehlich A.G." of Berlin, which takes no part in the Aircraft Industry.

B

BAHNBEDARF A/G.

Darmstadt.

This firm, which produces railway material, etc., established an aircraft department during 1922. They built in 1922 the Darmstadt "Geheimrath" soaring monoplane, which did well at the 1922 Rhoen competitions, and in 1923 the Darmstadt "Konsul," another soaring monoplane, which performed excellent at the 1923 meeting, was built to the designs of Herren Botsch and Spiess (see Glider Section).

The firm has recently produced a low-powered aeroplane.

THE BAHNBEDARF D.1.

A two-seater monoplane fitted with a 30 h.p. engine, designed by Dipl. Ing. Plauth. The light loading shows the influence of glider experience, and the speed attained on the power loading shows that the design is reasonably efficient.

Specification.

Span	**14.0 m. (45 ft. 11 in.).**
Length	**5.5 m. (18 ft.).**
Wing area	**17.5 sq. m. (187 sq. ft.).**
Weight empty	**290 kgs. (638 lbs.).**
Weight loaded	**440 kgs. (968 lbs.).**
Wing loading	**28.5 kgs./sq. m. (5.1 lbs./sq. ft.).**
Power loading	**16.7 kgs./h.p. (35.8 lbs./h.p.).**
Max. speed	**110 km.h. (68 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**12½ mins.**
Ceiling	**4,000 m. (13,120 ft.).**

B.F.W.

The Bayerische Flugzeug-Werke were newcomers to the German aircraft trade during the war.

The Gothaer Waggon Fabrik partook in the formation of the new company, for which the city of Fürth supplied a site works and testing ground. Carried out sub-contract work, and at the end of the war modern two-seaters of original design.

This firm has now become the B.M.W. or Bayerische Motoren-Werke of München-Oberwiesenfeld, building motor cycles and aero-engines.

BRANDENBURG.

The Hansa-Brandenburgische Flugzeugwerke was formed in 1915. These works were one of the biggest in the German aircraft industry.

The chief designer of Hansa-Brandenburgische Flugzeugwerke was Herr Ernst Heinkel, formerly of the Albatros firm, who has now formed the Ernst Heinkel Flugzeugwerke.

Hansa-Brandenburg was one of the three main suppliers of German seaplanes.

There is now no news of any aircraft activity.

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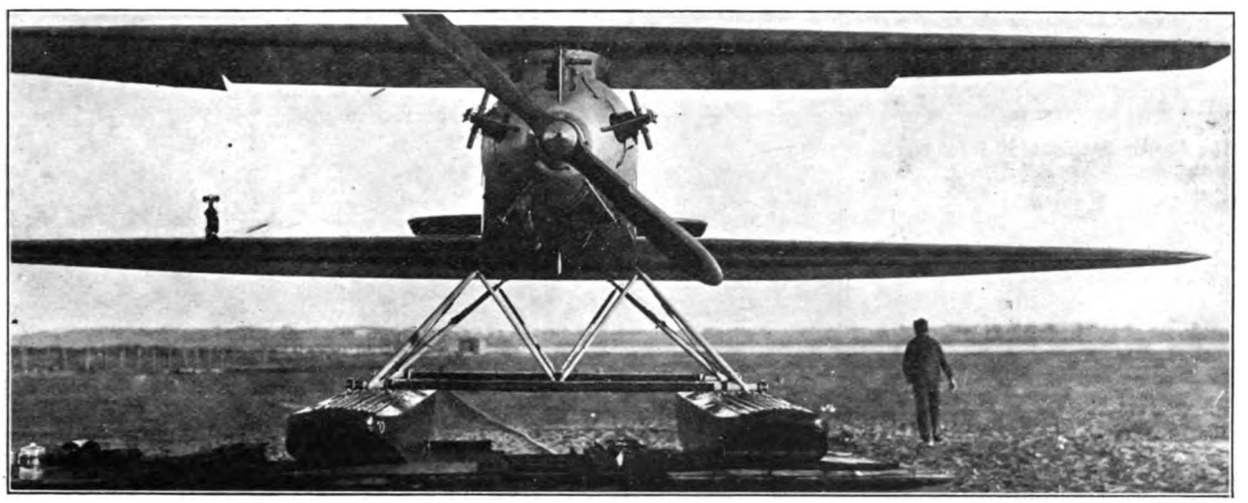
C



The Caspar Type U1 Seaplane (55 h.p. Siemens-Werke engine.)

CASPAR.

Caspar Werke Kom. Ges. Travemünde-Privall.

Director, Dipl. Ing. Caspar, well-known before the war as a pilot.

Founded 1922 by Dr. Ing. Carl Caspar, well known as a pilot before the War and during the War as Director of the Hanseatische Flugzeugwerke Carl Caspar. The designer originally was Herr Ernst Heinkel, who has now left and formed his own firm. His successor is Dipl. Ing. Ernst von Loessl. The machines known as the Caspar U1 and S1 were designed by Heinkel. The others here described are due to von Loessl, who has been largely concerned with the development of soaring gliders, and shows traces of that experience in his present designs. The Caspar firm made a very excellent showing of their products at the Gothenburg Exhibition in the summer of 1923.

THE CASPAR SEAPLANE TYPE U1.

This machine is designed specially in order that it may be stowed and packed in the smallest possible space. It has attracted the attention of certain foreign navies, particularly that of the United States, on account of this fact, which allows it to be carried even on a submarine.

The machine is a cantilever biplane of mixed construction, timber predominating. It is arranged to pack into a single cylindrical container 7 m. 40 long and 1 m. 70 diam., and on tests it has been erected by four men in 1 min. 3 secs.

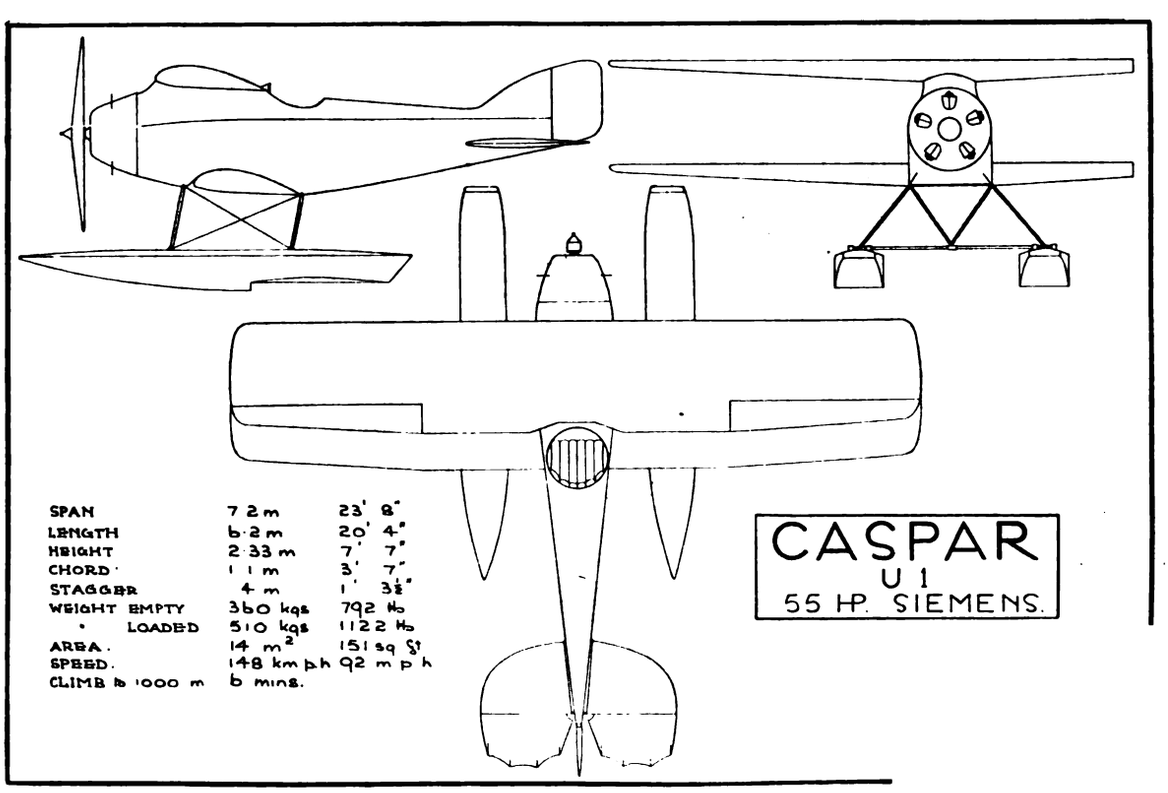
The specification is given in the attached drawing.

THE CASPAR S.1. SEAPLANE.

This machine, which has been adopted by the Swedish Naval Air Service, is a two-seater float monoplane of a design very reminiscent of the war-time Hansa-Brandenburg monoplanes.

Specification of the Caspar S.1.

Span	**17.5 m. (57 ft. 5 in.).**
Length	**12.65 m. (41 ft. 6 in.).**
Height	**3.85 m. (12 ft. 7 in.).**
Useful load	**700 kgs. (1,540 lbs.).**
Engine	**260 h.p. Maybach.**
Speed	**160 km.h. (100 m.p.h.).**
Range	**600 km. (375 miles).**


SPAN 7·2m 23' 8"
LENGTH 6·2m 20' 4"
HEIGHT 2·33m 7' 7"
CHORD 1·1m 3' 7"
STAGGER 4m 1' 3½"
WEIGHT EMPTY 360 kgs 792 lb
LOADED 510 kgs 1122 lb
AREA. 14 m² 151 sq ft
SPEED. 148 km p h 92 m p h
CLIMB to 1000 m 6 mins.
CASPAR
U1
55 HP. SIEMENS.

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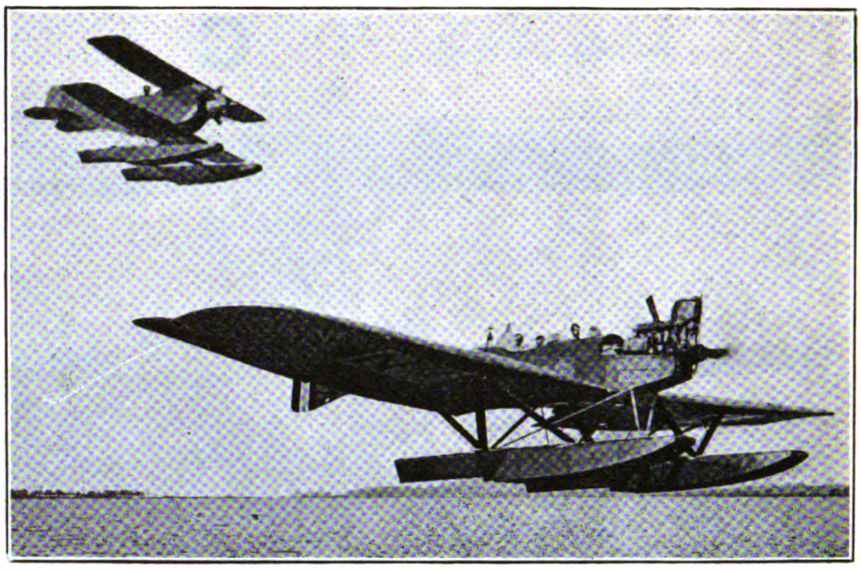
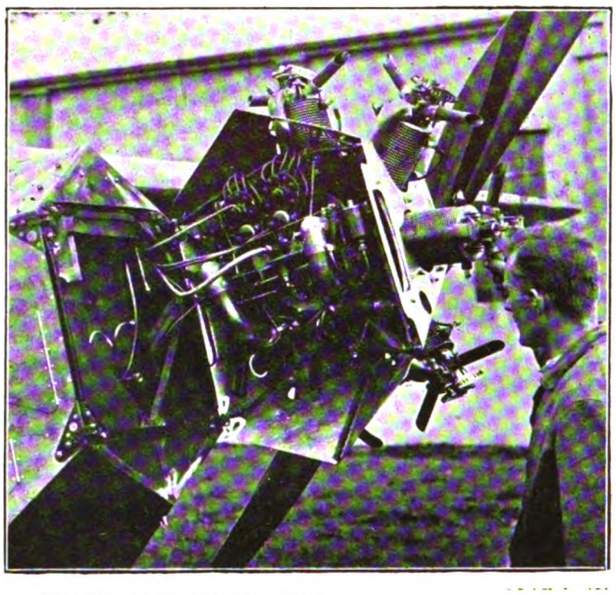
CASPAR—*continued.*



The Caspar Seaplanes U.I. (above) and S.1. (below.)



The hinged engine mounting.

THE CASPAR L.E.11.

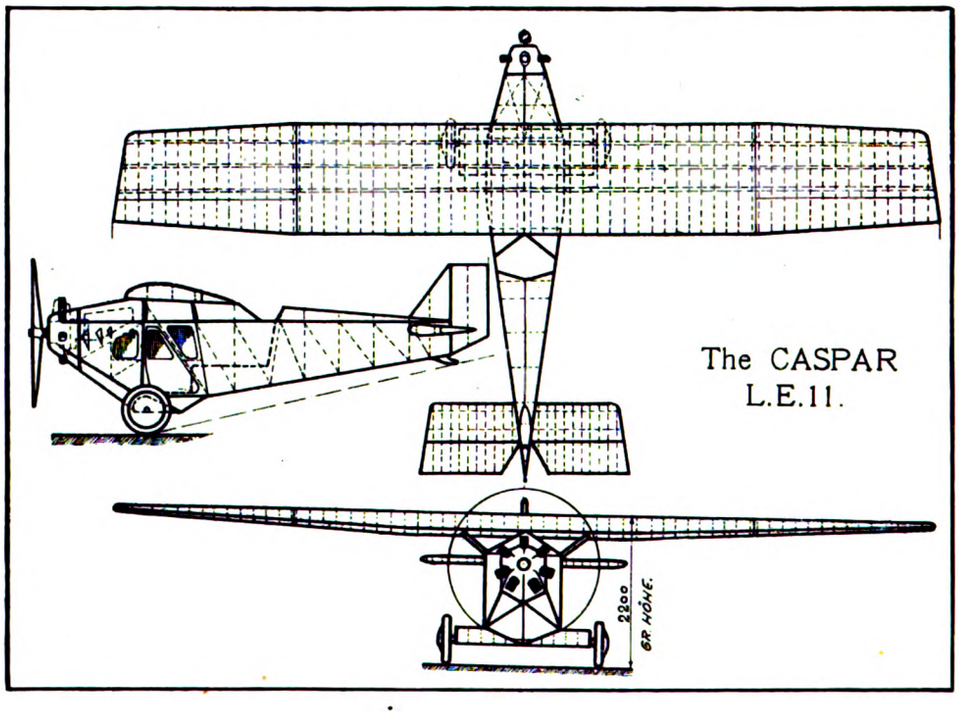
This is a small three-seater cantilever monoplane with the wing above the fuselage, fitted with the 80 h.p. Siemens-Halske air-cooled radial. It is entirely of timber construction.

The pilot in this machine is behind the wing, but owing to the inverted V section of the upper part of the fuselage he has an excellent view forward below the wing for landing as well as a clear view above the wing. Under tests officially observed at Travemünde the machine with full load showed a speed of 163 km.h. (101 m.p.h.) which is distinctly good for a three-seater of such low power.

The fact that this speed has been reached with a slab-sided and somewhat angular fuselage would seem to confirm the idea that the best shape for a fuselage is by no means necessarily the form which by itself has the lowest resistance.

Specification of the Caspar L.E.11.

Span	**12 m. (39 ft. 5 in.).**
Length	**6.65 m. (21 ft. 10 in.).**
Height	**2.20 m. (7 ft. 2 in.).**
Capacity	**Pilot, 2 passengers and 50 kgs. (110 lbs.) luggage.**
Engine	**Siemens-Halske 80 h.p.**
Speed	**163 km.h. (101 m.p.h.).**
Range	**800 km. (490 miles).**



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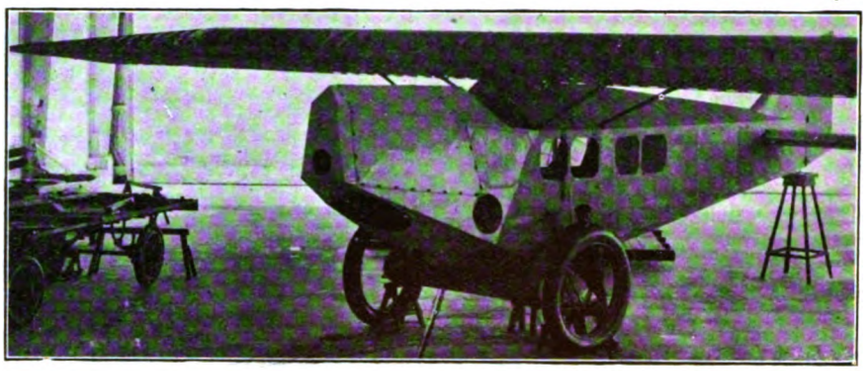
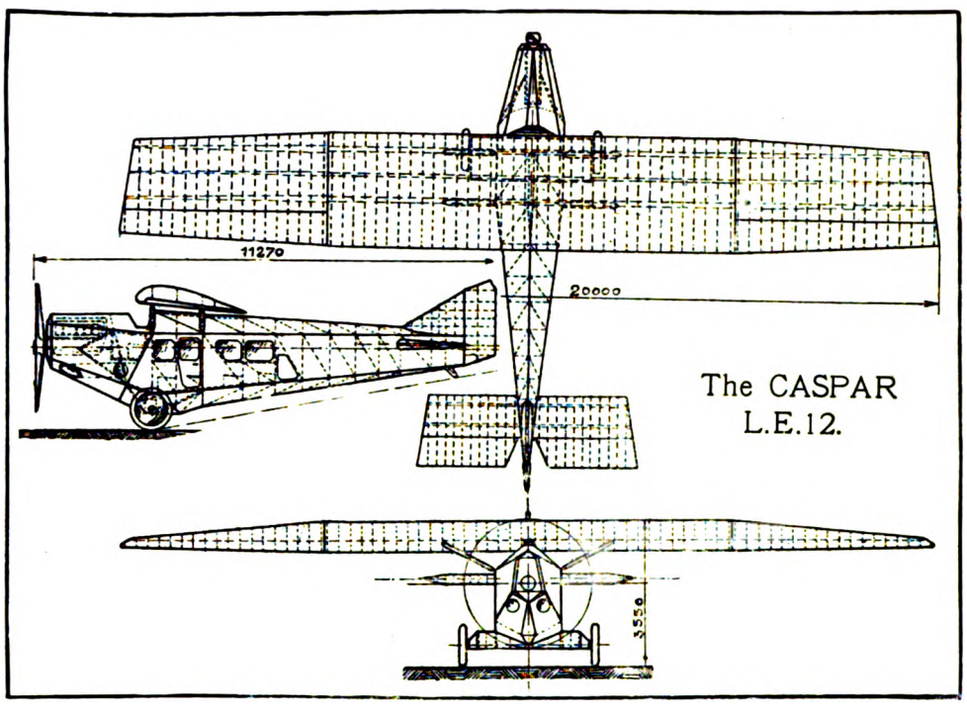
CASPAR—*continued.*



The C.L.E. 12 in course of Erection.



THE CASPAR L.E.12.

A cantilever monoplane of 20 m. (65 ft. 7 in.) span for commercial passenger carrying.

The machine carries pilot and nine passengers, and can be fitted with the Maybach or Mercédès 260 h.p. engine, or with a "Falcon" or "Eagle" Rolls-Royce. The wing is built in three sections, of which the central part is of uniform chord and section. The tip sections taper in both chord and thickness. The fuselage is throughout of the slab-sided type and wings, fuselage and tail surfaces are three-ply covered.

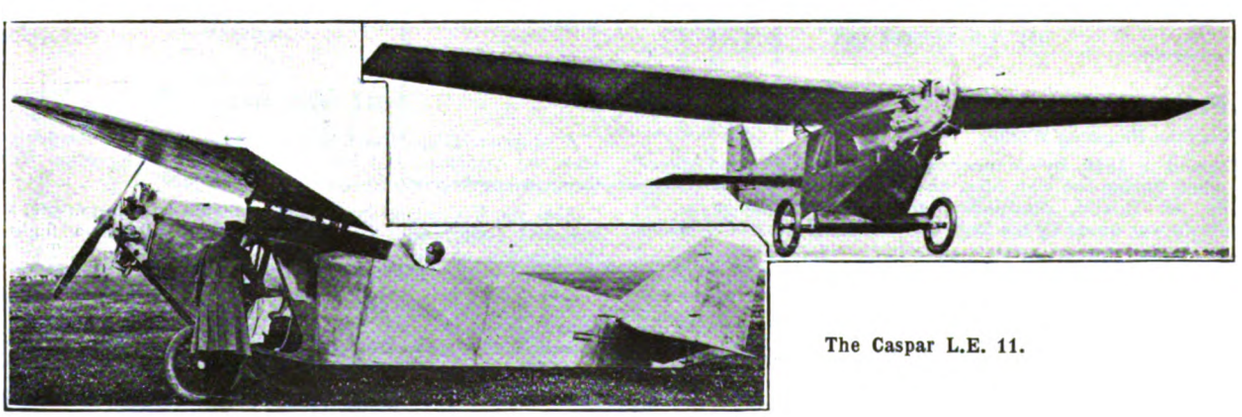
The undercarriage consists of a rubber-sprung axle carried inside a wing section girder attached to the bottom of the fuselage.

The machine is of mixed steel and wooden construction, steel tube being used for heavily-stressed main members.

The general form of the machine is adequately shown in the general arrangement drawings.

Specification of the Caspar L.E.12.

Span	**20 m. (65 ft. 7 in.).**
Length	**11.27 m. (37 ft.).**
Height	**3.55 m. (11 ft. 8 in.).**
Useful load	**1,320 kgs. (2,905 lbs.).**
Capacity	**1 pilot and 9 passengers.**
Range	**900 km. (560 miles).**



The Caspar L.E. 11.

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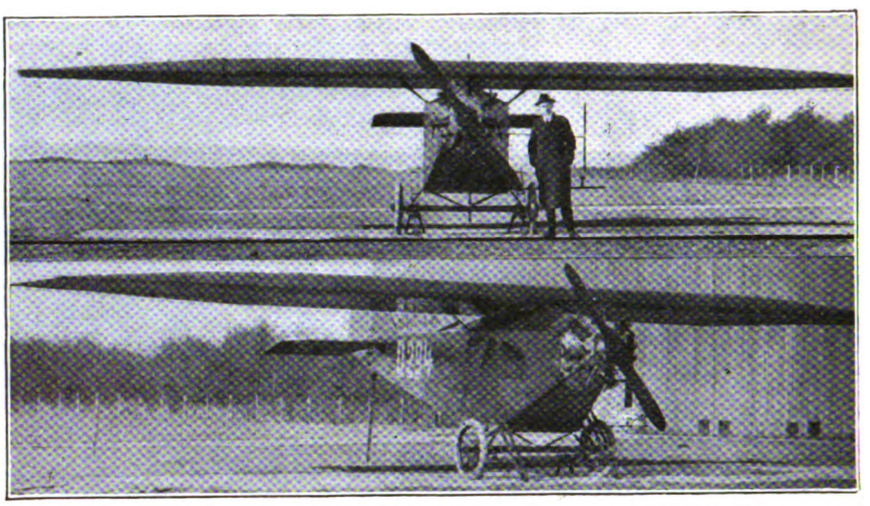
CASPAR—continued.



The Caspar C.16 (80 h.p. Siemens "Halske" engine.

The Caspar C.16.

THE CASPAR C.16.

A three-seater monoplane of very similar type to the C.L.E.11 previously described and fitted with the same engine. The photograph gives as much information as is available.

THE CASPAR C.17.

A two-seater light aeroplane designed to the 20 h.p. Bristol "Cherub" engine. It is a "low-wing" cantilever monoplane with a retractable undercarriage which folds flat against the under surface of the wing. A very light folding hood, with Cellon windows is fitted to cover the occupants, who are seated in tandem.

Specification of the C.17.

Span	**12.0 m. (39 ft. 5 in.).**
Length	**4.50 m. (14 ft. 9 in.).**
Height	**1.46 m. (4 ft. 9 in.).**
Engine	**Bristol "Cherub," 20 h.p.**
Weight empty	**180 kgs. (396 lbs.).**
Weight loaded	**350 kgs. (770 lbs.).**
Max. speed	**80 km.h. (50 m.p.h.).**
Climb to 500 m. (1,640 ft.)	**7 mins.**
Endurance	**2 hours.**

D

DAIMLER.

Daimler Werke A. G., Untertuerkheim (Wttbg).

Beside having been one of the two chief German makers of aero-engines, The Daimler Werke turned out aeroplanes as sub-contractors as well in the late War.

When, during the later part of the War, the Daimler firm turned out an 8-cylinder engine in response to the Hispano-Suiza, they started themselves to build high-speed single and two-seater aircraft at Sindelfingen.

The War ended, however, before the new models had gone through the class trials and had entered the quantity production stage, and the works have since had to be adopted for other work.

D.F.W.

Deutsche Flugzeug Werke.

Formed in 1910, by Commercial Counsellor Bernhard Meyer, who died during the war, after having, like the late Sir George White, of Bristol, established an important factor in his country's war needs by his keen faith in the future of aviation.

At one time turned out Farman biplanes, later a "Steel dove," and producing a characteristic, as monoplane, which won the 1913 Prince Henry trophy.

In 1914, the D.F.W. company was turning out a number of successful types, one of their biplanes, with a 150 h.p. Benz motor winning the "three-cornered flight," and the standard 100 h.p. Mercedes-engined type putting up the world's altitude record of 25,750 feet, piloted by Oelerich.

The D.F.W. was during the War one of the chief constructors of two-seater biplanes of the C class to the German army, but had also taken up the production of giant aeroplanes. A type of their own was turned out with a four-engine central power plant, each engine driving its own propeller through a transmission shaft. At the time of the Armistice this type was about to pass to a second stage of development, an enlarged edition to be driven by eight engines of 270 h.p. each having been designed.

The plans of this 2,160 h.p. multiple-engined D.F.W. giant did not get beyond the drawing-office and were published in the 1920 edition of this Annual.

POST WAR MACHINES.

A commercial specimen of the original giant was started upon after the Armistice, but was not passed for construction by the Commission Aeronautique Inter-Alliée.

Also the C.V model has been converted to a limousine, with enclosed cabin, and was shown in Holland by a flight to Amsterdam at the time of the Elta Exhibition. This was described in the 1922 volume.

The firm has now become the Allgemeine Transportanlagen Gesellschaft, or "A.T.G.," of Leipzig-Grosszschocher, and manufactures vehicles of all kinds, but since 1920 no aircraft.

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DIETRICH-GOBIET.

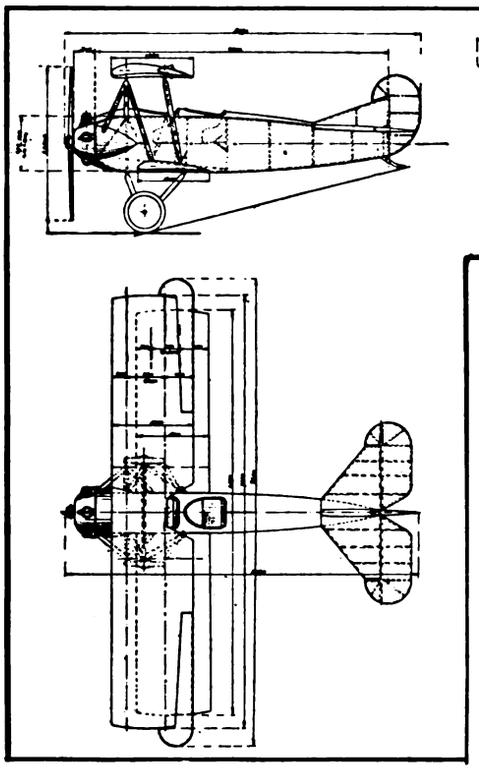
Dietrich Gobiet Flugzeugwerke A.G., Cassel.

Richard Dietrich, formerly of the Fokker Flugzeugwerke, founded a firm known as "Richard Dietrich G.m.b.H." at Mannheim in 1922. This firm produced the D.P.1 biplane described in the 1922 volume of this work. In 1923 the firm became the "Dietrich-Gobiet Flugzeugwerke," and their works were transferred to Cassel. They have since produced the machines and designs hereafter mentioned.

THE D.P.II.

A two-seater biplane very similar in general design to the earlier D.P.I. The new machine, however, is entirely of the cantilever type, whereas the original possessed normal wire-bracing to the wings. The D.P.II is fitted with either the 5-cylinder 55 h.p. or the 7-cylinder 70/80 h.p. Siemens-Halske engine.

In general arrangement this machine is strongly reminiscent of the war-time Fokker D.VII, and in detail construction—such as the use of welded steel tubes for fuselage and tail surfaces—it is also remarkably like a Fokker. This fact is to some extent accounted for by Herr Dietrich having been associated with Fokker during the War. The upper wing has a greater span and chord than has the lower, is staggering forward, and is set at 1° greater incidence than is the lower wing.



The Dietrich D.P. II.

Specification of the Dietrich D.P.II.

Span	**7.6 m. (25 ft.).**
Length	**5.97 m. (19 ft. 8 in.).**
Height	**2.43 m. (8 ft.).**
Weight empty	**340 kgs. (748 lbs.).**
Weight loaded	**560 kgs. (1,233 lbs.).**
Speed (50 h.p.)	**145 km.h. (90 m.p.h.).**
Ceiling	**3,800 m. (12,500 ft.).**
Range	**500 km. (310 miles).**

THE D.P.III.

The machine known as the D.P.III is a cantilever monoplane carrying a crew of two side-by-side just ahead of the wing, with a six-seated cabin just below the wing. The machine may be fitted with any engine of about 230 h.p., the Siddeley "Puma," the 260 h.p. Maybach, or Mercédès, and the "Falcon" Rolls-Royce being considered suitable for the purpose.

The general arrangement drawing gives a clear idea of the lay-out of this machine.

Specification of the D.P.III.

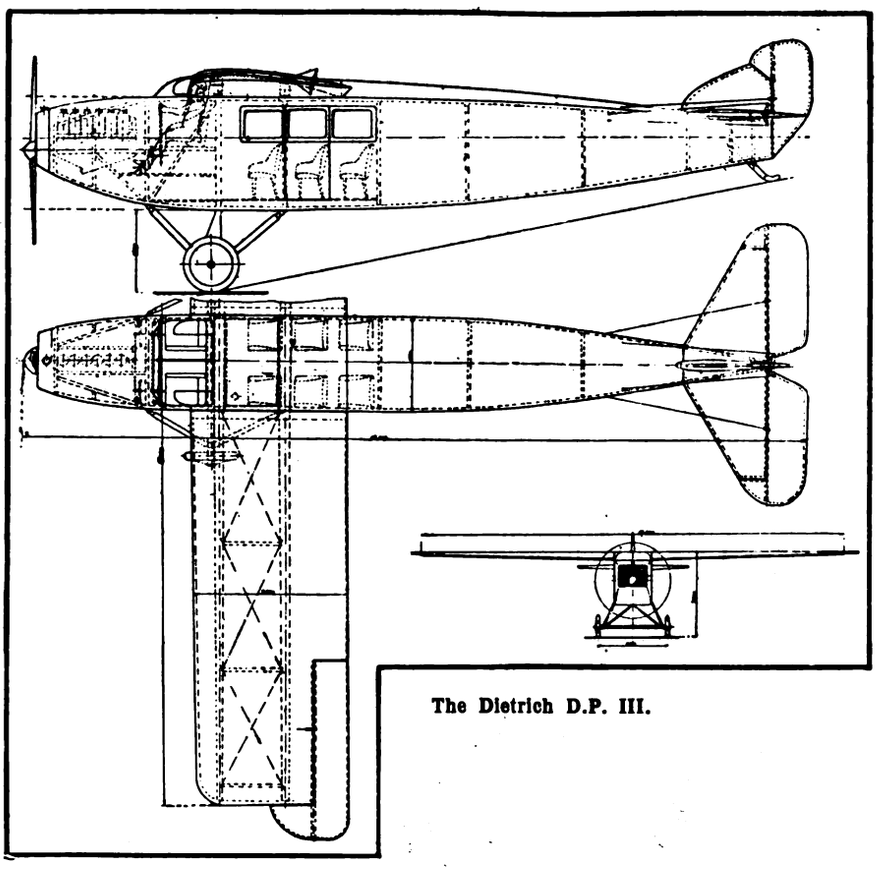
Span	**17 m. (55 ft. 9 in.).**
Length	**12.5 m. (41 ft.).**
Height	**3.6 m. (11 ft. 10 in.).**
Weight empty	**1,300 kgs. (2,860 lbs.).**
Weight loaded	**2,200 kgs. (4,840 lbs.).**
Max. speed	**150 km. (92 m.p.h.).**
Ceiling	**8,000 m. (9,840 ft.).**
Range	**950 km. (590 miles).**

THE D.P.VII.

The Dietrich Gobiet firm also produced a two-seater sporting monoplane with the 30 h.p. Haacke engine, known as the D.P.VII. It is a low-wing monoplane with rigid bracing from the top of the fuselage to a little under half the span of the wings. The wing section is extremely thick and the fuselage is short and somewhat fat.

Specification.

Span	**8.0 m. (26 ft. 2 in.).**
Length	**5.4 m. (17 ft. 8 in.).**
Height	**1.95 m. (6 ft. 5 in.).**
Wing area	**10.6 sq. m. (114 sq. ft.).**
Weight light	**180 kgs. (396 lbs.).**
Weight loaded	**340 kgs. (748 lbs.).**
Wing loading	**32 kgs./sq. m. (6.55 lbs./sq. ft.).**
Power loading	**9.6 kgs./h.p. (22 lbs./h.p.).**
Max. speed	**115 km.h. (71 m.p.h.).**
Ceiling	**2,400 m. (7,870 ft.).**
Range	**350 km. (220 miles).**



The Dietrich D.P. III.

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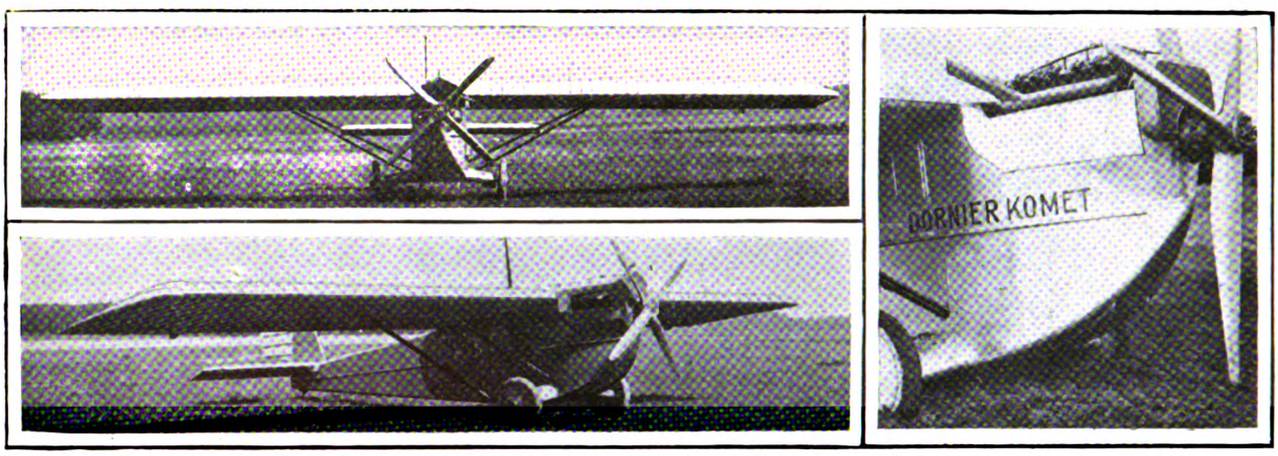


The Dornier Komet II.

DORNIER.

Dornier Metallbauten G.m.b.H., Friedrichshafen.

Dipl. Ing. Claude Dornier started the development of metal aircraft in the very early days of the War, in accordance with the intentions of Graf Zeppelin. His earliest products of this type were giant flying-boats, and his efforts in this direction were supported by the Zeppelin interests.

In association with those interests, Dornier metal aircraft of various types have been produced. During 1922 the firm formerly known as Zeppelin Werke, Lindau, G.m.b.H., has changed its title to the above.

The characteristic feature of Dornier aircraft is the use of high-grade steel members of very light construction for those parts which bear the most intense stresses, and of flat duralumin sheet for the other parts.

Dornier designs are also being constructed under license in Switzerland, Italy and the U.S.A., and reference should be made to these countries for information as to Dornier type, which cannot be built in Germany owing to the Allied restrictions on aircraft construction.

THE DORNIER "KOMET II."

Since this machine was described in the 1922 volume, it has been possible to obtain a more detailed account of its structure which is therefore given here.

The machine is a monoplane with a thick wing placed on top of a deep box-section fuselage. The wings are braced from the bottom of the fuselage by steel tube stays running out to about one-third of the half span on each spar. Within the fuselage and below the wing is a comfortable cabin seating four, two facing forward and two aft. The pilot's cockpit is above and forward of the cabin.

The engine is mounted high in the fuselage, and the undercarriage consists of two axles, which project horizontally from the lower corners of the fuselage and are supported by and sprung from a pair of wing section projections built on to the side of the fuselage.

The metal construction of the machine is of considerable interest. It is generally very simple, and should be quite cheap—and it appears to give satisfactory results. The main wing spars, and also those of the tail surfaces, are built of high tensile steel. All the rest of the machine is duralumin.

The wing and tail spars are constructed of D section top and bottom members tied together by a Warren bracing of trough section. On the wings there are used a relatively small number of box section ribs of duralumin of great stiffness, with apparently intermediate former ribs of flat sheet. The covering consists of flat sheets with turned up flanges which fit between the former ribs and are riveted through the projecting edges of these ribs after being covered with a trough section capping strip. The tail surface covering is applied in the same way.

The fuselage is built entirely of duralumin, and consists of formers covered with quite fairly thick sheet—somewhere about 18 gauge apparently. The formers are of a channel section with turned-up flanges, very similar to that used for the steel spar flanges, and a similar section is used for certain longitudinal stiffeners applied to the outside of the fuselage covering, and for the supports of the engine bearers.

All the hinged control surfaces are built on very stout steel tube front spars, carried in substantial bearings, which embrace the tubes. In the case of the ailerons, this tube is about 3 in. diameter. In all cases the hinge tube is recessed into the fixed surface ahead of it, so that there is practically no gap at the hinges.

The ailerons are balanced by a balancing plane carried above and ahead of the hinges.

The undercarriage consists of two cantilever wing-like projections from the bottom of the fuselage, which carry hinged and sprung axles.

Originally this machine was fitted with the original B.M.W. IIIa engine of 185 h.p. As this engine was of the super-compressed type, it gave the machine a ceiling higher than that admissible under the regulations imposed on German aircraft. Consequently the machine is now fitted with a peace-time type B.M.W. of a maximum output of 180 h.p., which has slightly reduced the machine's performance. It is however understood that the machine cruises at about 80 m.p.h. with full load.

During 1923 a number of Dornier "Komets," with Rolls-Royce "Falcon" engines, have been built for Spain, Columbia, Russia and the Ukraine.

The main dimensions of the "Komet" are given in the following specifications :—

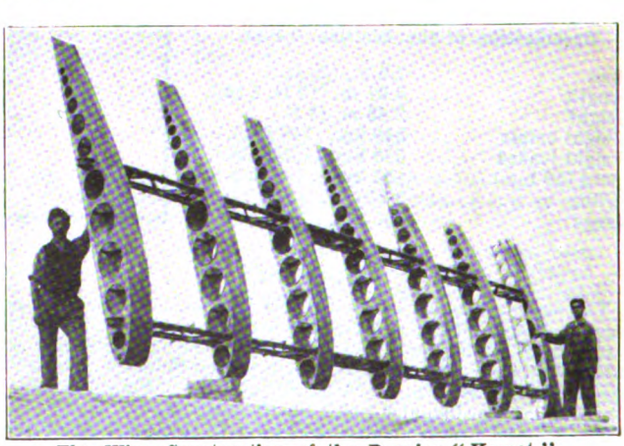
Specification of the Dornier "Komet II" (with 180 h.p. B.M.W.)

Span	**17 m. (55 ft. 10 in.).**
Length	**9.1 m. (29 ft. 9 in.).**
Chord	**3 m. (9 ft. 10 in.).**
Height	**2.5 m. (8 ft. 2½ in.).**
Area	**47 sq. m. (505 sq. ft.).**
Weight empty	**1,100 kgs. (2,420 lbs.).**
Weight loaded	**1,900 kgs. (4,180 lbs.).**
Engine	**185 h.p. B.M.W.**
Wing loading	**38.8 kgs./sq. m. (8 lbs./sq. ft.).**
Power loading	**9.9 kgs./h.p. (21.6 lbs./h.p.).**
Speed	**170 km.h. (106 m.p.h.).**

THE "KOMET III."

A larger and more powerful version of the original "Komet" type, produced in 1923 to provide higher speed and greater capacity for air-line services. The machine has seats for pilot and mechanic side-by-side in front of the wing, and has a cabin 3 m. × 1.4 m. wide and 1.5 m. high (9 ft. 10 in. × 4 ft. 7 in. × 4 ft. 11 in.), with seats for six passengers. The wing of the new "Komet" is raised above the fuselage on four short struts, instead of being on top, as in the "Komet II," and the undercarriage is of different form to that of the original. Very large landing wheels are fitted.

Fuel tanks are in the wing and gravity feed is employed. A Rolls-Royce "Eagle" or the 400 h.p. "Liberty" engine may be used.



The Wing Construction of the Dornier "Komet."

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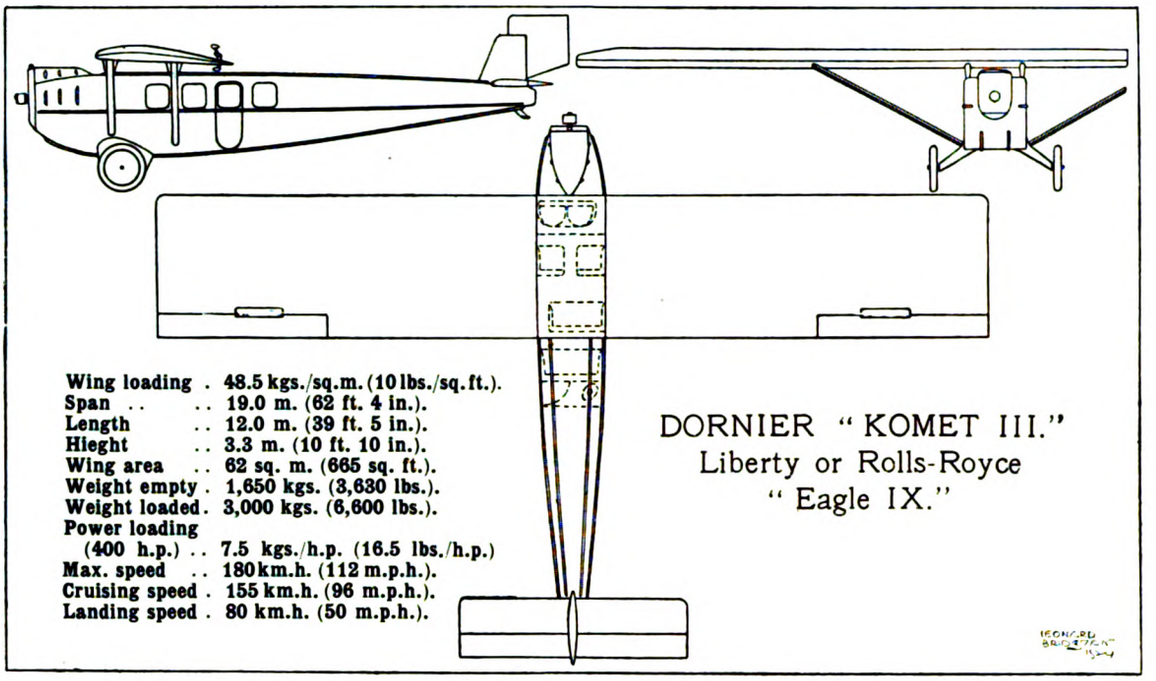
DORNIER*—*continued.



Wing loading	**48.5 kgs./sq.m. (10 lbs./sq.ft.).**
Span	**19.0 m. (62 ft. 4 in.).**
Length	**12.0 m. (39 ft. 5 in.).**
Hieght	**3.3 m. (10 ft. 10 in.).**
Wing area	**62 sq. m. (665 sq. ft.).**
Weight empty	**1,650 kgs. (3,630 lbs.).**
Weight loaded	**3,000 kgs. (6,600 lbs.).**
Power loading (400 h.p.)	**7.5 kgs./h.p. (16.5 lbs./h.p.)**
Max. speed	**180 km.h. (112 m.p.h.).**
Cruising speed	**155 km.h. (96 m.p.h.).**
Landing speed	**80 km.h. (50 m.p.h.).**

DORNIER "KOMET III."
Liberty or Rolls-Royce
"Eagle IX."

THE DORNIER "DELPHIN II."

The curious-looking machine illustrated in the accompanying photographs is the Dornier flying-boat "Delphin" (Dolphin). This may be considered as a hybrid between a flying-boat and an ordinary tractor monoplane. A comparison with the "Komet" land-going monoplane described on the previous page shows great resemblance in the two designs.

The body may be regarded as either a boat built up to fulfil the functions of a tractor type fuselage, or as the fuselage of such a machine as the "Komet," fitted with a hydroplane bottom.

The wings are in two pieces attached to the top of this boat fuselage, and below is situated a passenger cabin, exactly as in the land machine and, like it, fitted for six passengers. The wings themselves are identical with those of the already described "Komet," and so are the tail organs.

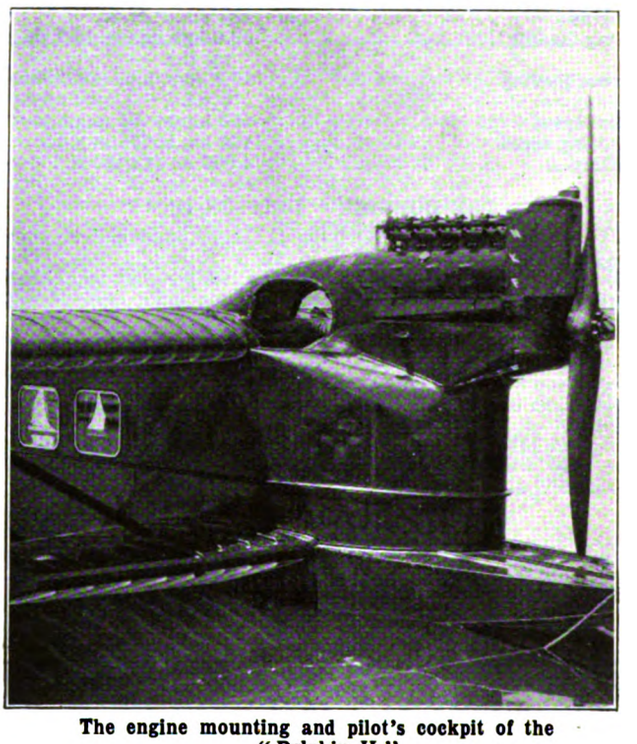
In place of the projecting supports carrying landing wheels there are now very much larger projections, serving as lateral floats on the water and as lifting surfaces in the air, and the front lift tubes which run up to the wings are carried from these projections. The rear bracing comes from the body itself.

In the water machine the engine has been raised very considerably as compared to its position in the land machine, In order to give the pilot a view past the engine, which projects high above his head, the engine casing has been narrowed down in a manner clearly shown in the photographs.

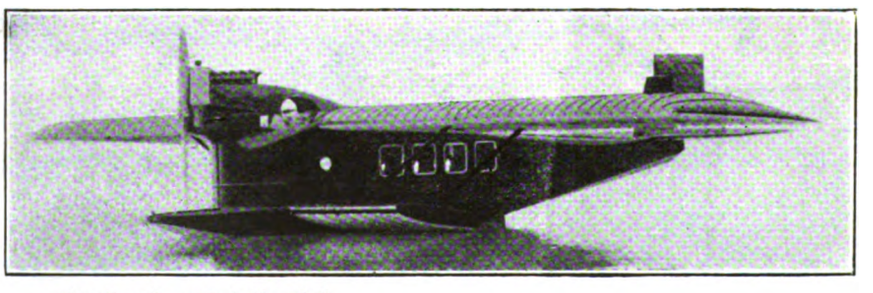
Generally speaking, the construction of the machine follows exactly that of the "Komet" already described. High-tensile steel is used for spars, struts and other heavily stressed members, and duralumin serves for covering and for lightly loaded members.

Specification of the Dornier "Delphin."

Span	**17 m. (55 ft. 10 in.).**
Length	**10.25 m. (33 ft. 7 in.).**
Height	**2.75 m. (9 ft. 1 in.).**
Chord	**3.0 m. (9 ft. 10 in.).**
Area	**47 sq. m. (505 sq. ft.).**



The engine mounting and pilot's cockpit of the "Delphin II."



The Dornier "Delphin II."

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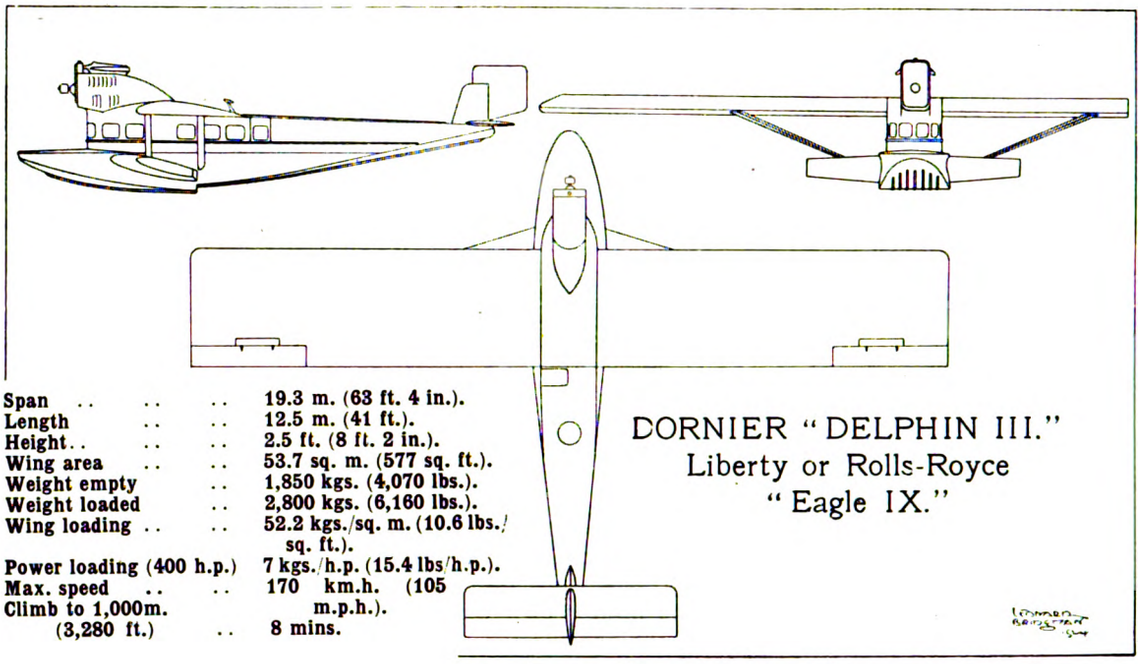
DORNIER—*continued.*



DORNIER "DELPHIN III."
Liberty or Rolls-Royce
"Eagle IX."

Span	19.3 m. (63 ft. 4 in.).
Length	12.5 m. (41 ft.).
Height	2.5 ft. (8 ft. 2 in.).
Wing area	53.7 sq. m. (577 sq. ft.).
Weight empty ..	1,850 kgs. (4,070 lbs.).
Weight loaded ..	2,800 kgs. (6,160 lbs.).
Wing loading	52.2 kgs./sq. m. (10.6 lbs./sq. ft.).
Power loading (400 h.p.)	7 kgs./h.p. (15.4 lbs/h.p.).
Max. speed	170 km.h. (105 m.p.h.).
Climb to 1,000m. (3,280 ft.) ..	8 mins.

Weight empty	1,350 kgs. (2.970 lbs.).
Weight loaded	2,100 kgs. (4,620 lbs.).
Engine	180 h.p. B.M.W.
Wing loading	42.9 kgs./sq. m. (8.7 lbs./sq. ft.).
Power loading	10.8 kgs./h.p. (23.7 lbs./h.p.).
Max. speed	150 km.h. (93 m.p.h.).
Cruising speed	120 km.h. (75 m.p.h.).
Ceiling	4,000 m. (13,120 ft.).

THE DORNIER "DELPHIN III."

A modification of the "Delphin II" type, analogous to that made by the "Komet III" in the "Komet" class. The machine has been enlarged, the engine has been set somewhat further back, and the pilot and mechanic have been placed below the engine in an enclosed cabin.

The passenger cabin below the wing is enlarged to carry six passengers, and a Rolls-Royce "Eagle" or a 400 h.p. "Liberty" engine can be fitted. Steel rubbing shakes are fitted to the hull bottom, to allow the machine to take-off from and land on ice.

Many of the components—wings, tail units, etc.—of the "Komet III" and "Delphin III" are interchangeable—as is the case with "Komet II" and "Delphin II" and with "Libelle" and "Spatz."

THE DORNIER "LIBELLE."

The Dornier "Libelle" flying-boat is an all-metal machine, except for the covering of the rear third of the wings and control surfaces. There is no wire bracing whatsoever. The factor of safety exceeds 8 in cases A and B of the German construction and acceptance specifications.

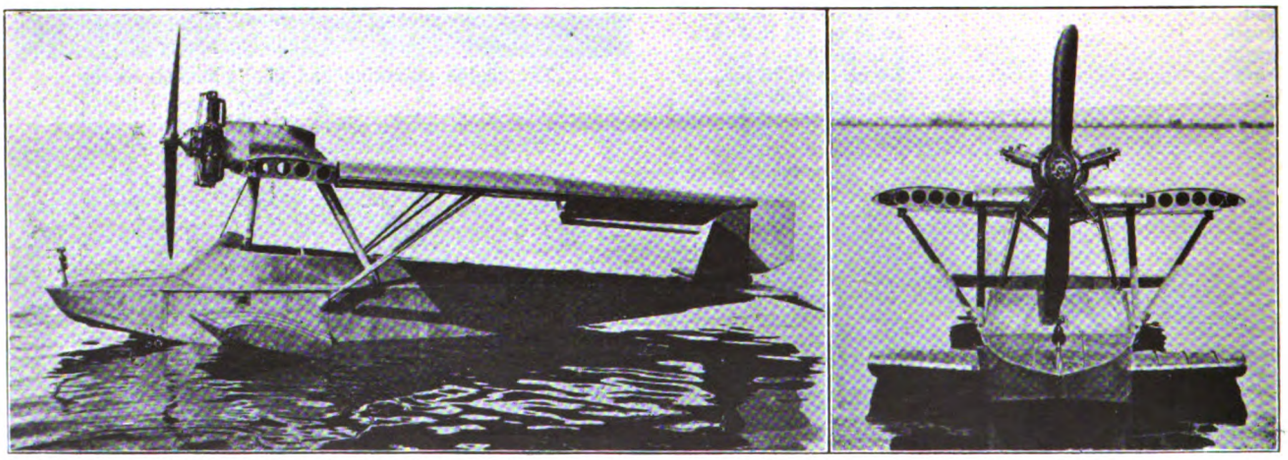
The engine is fitted forward and high up. It is a 60 h.p. Siemens and Halske 5 cylinder air-cooled radial engine. It can be attended to with the greatest ease. The position of the airscrew forward eliminates all danger of damage to the airscrew by any foreign bodies. Should fracture of the airscrew occur however, no damage would result to any vital parts of the machine such as control cables, wings, etc.

Three seats are provided in the hull, two being forward next to each other and the third behind these. Dual control for instruction purposes is provided.

The flying qualities are excellent. The machine takes off with the greatest ease in 20 to 40 seconds. When fitted with a 50 to 60 h.p. 5 cylinder engine, with three occupants and fuel and oil for 130 km., this machine took off at an altitude of 400 m. above sea-level without the slightest difficulty.

The weight of the flying-boat ready for flight is about 350 kgs. It can easily be carried by one or two men. In order to facilitate housing, the wings can be folded back in the most simple manner. Thus a space 6.8 × 3.2 × 2.3 m. is all that is required to house the flying boat with folded back wings. The folding back can be done even by inexperienced personnel in 1½ minutes and the wings spread in 2½ minutes. Both manœuvres can be carried out on the water. When the wings are folded back, the machine can be controlled on the water like a motor-boat.

A larger engine—70 h.p. of the same make has been fitted to some machines of this type. With this engine, flights with pilot and five passengers were made in 1923, and the machine was found to be quite capable of landing on and taking off from the ice on the Bodensee.



The Dornier "Libelle" flying boat with wings folded.

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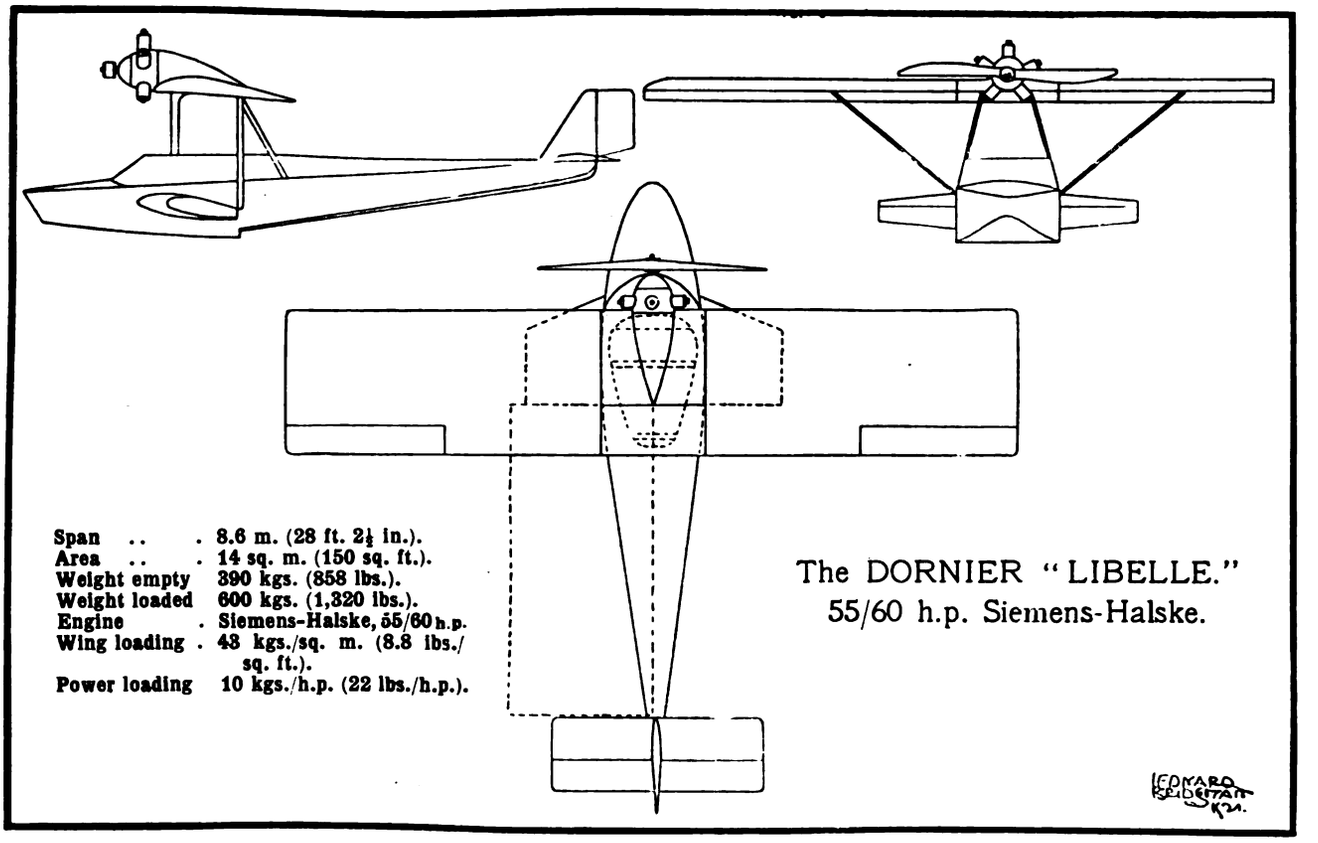
DORNIER—*continued.*



Span	8.6 m. (28 ft. 2¼ in.).
Area	14 sq. m. (150 sq. ft.).
Weight empty	390 kgs. (858 lbs.).
Weight loaded	600 kgs. (1,320 lbs.).
Engine	Siemens-Halske, 55/60 h.p.
Wing loading	43 kgs./sq. m. (8.8 lbs./sq. ft.).
Power loading	10 kgs./h.p. (22 lbs./h.p.).

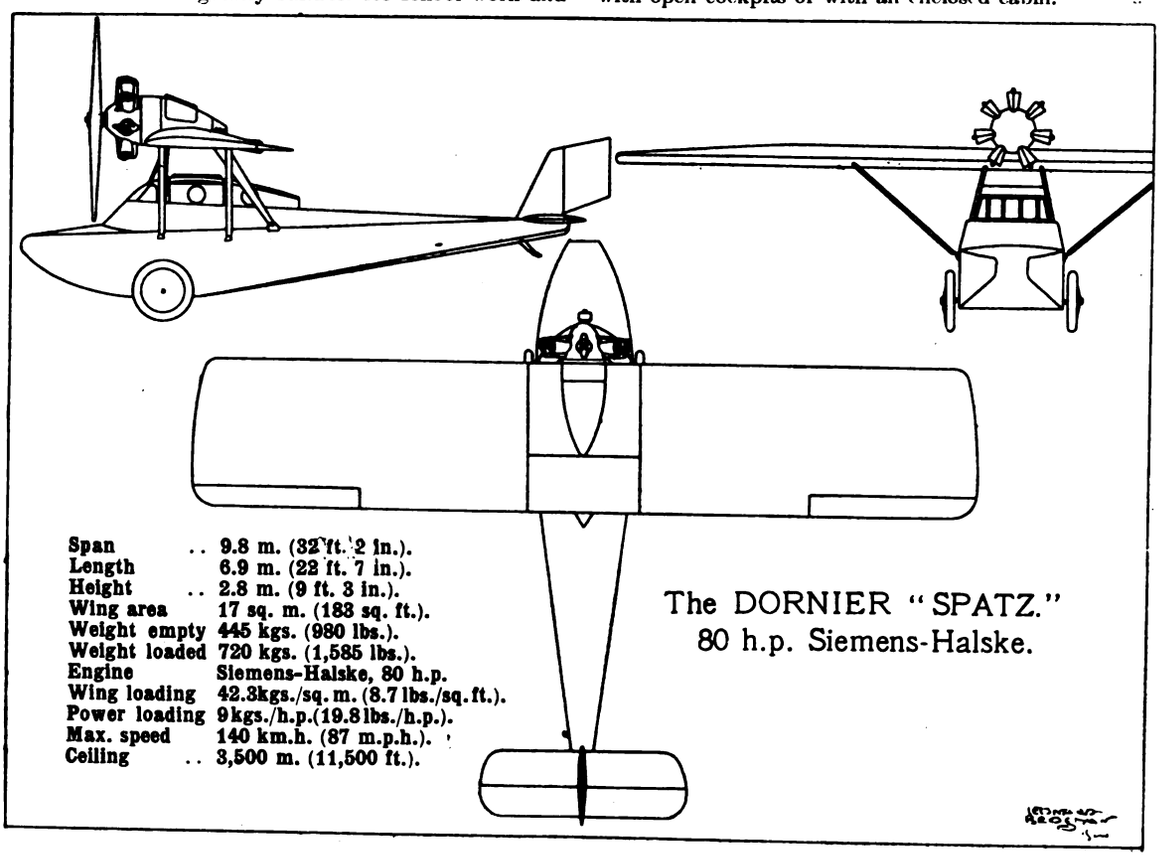
The DORNIER "LIBELLE."
55/60 h.p. Siemens-Halske.

THE DORNIER "SPATZ."

A school and sporting monoplane produced and tested at the end of 1923. It may be regarded as a Dornier "Libelle" flying-boat with the steps removed from the hull and with wheels fitted in place of the side float wing structures of the original. The machine is a three-seater fitted with an 80 h.p. Siemens-Halske radial engine. A version fitted with the 100 h.p. Bristol "Lucifer" can also be supplied as a three or four-seater.

The machine is of all-duralumin construction, and its general arrangement renders it singularly suitable for school work and for landing on rough ground. The low projecting body, combined with the low C.G., make it impossible for the machine to turn over on landing, and the airscrew and engine are amply protected. The wings fold—as in the "Libelle"—and the machine can then be housed in a space of 6.9 m. × 3.2 m. × 2.8 m. (22 ft. 7 in. × 10 ft. 6 in. × 9 ft. 3 in.).

There are two side-by-side seats in the front, below the wings, and a third, with space for baggage or goods behind. Dual control, with a declutching gear, so that one control may be cut out, is fitted to the front seats. The machine can be supplied with open cockpits or with an enclosed cabin.



Span	9.8 m. (32 ft. 2 in.).
Length	6.9 m. (22 ft. 7 in.).
Height	2.8 m. (9 ft. 3 in.).
Wing area	17 sq. m. (183 sq. ft.).
Weight empty	445 kgs. (980 lbs.).
Weight loaded	720 kgs. (1,585 lbs.).
Engine	Siemens-Halske, 80 h.p.
Wing loading	42.3kgs./sq. m. (8.7 lbs./sq. ft.).
Power loading	9 kgs./h.p. (19.8 lbs./h.p.).
Max. speed	140 km.h. (87 m.p.h.).
Ceiling	3,500 m. (11,500 ft.).

The DORNIER "SPATZ."
80 h.p. Siemens-Halske.

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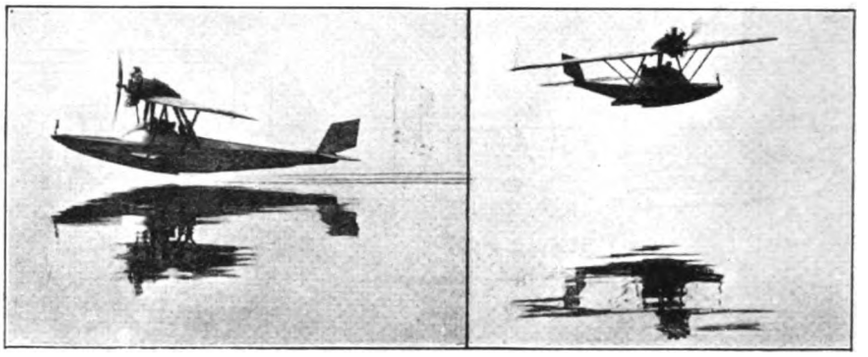
DORNIER—*continued.*

THE DORNIER "GREIF."

This machine has not been allowed to pass the design stage in Germany by the Inter-Allied Commission. It was a twin-engined monoplane with the engines carried below the wings, somewhat as in the 1923 Farman F.3X monoplane, and was intended to carry ten passengers.

THE DORNIER "WAL."

A twin-engine flying-boat which may not be built in Germany. It is built in Italy by the associated firm, Societa Anonima di Construzzione Mechaniche, of Pisa, which see.



The Dornier Libelle.

THE DORNIER "FALKE."

A high-performance single-seat fighter, also forbidden in Germany, but built by the Dornier licensees in Switzerland and Italy, to which reference should be made. The Wright Aeronautical Corporation also hold a licence to build this type in U.S.A.

DRESDNER.

Segelflugzeugbau : Commemiusshasse 65, Dresden 16.

This firm was founded at the end of 1922 to design and build gliders and low-powered machines.

E

ENTLER.

Entler Werke, Wilhelmshafen.

A small two-seater was produced by this new German firm in 1922. The designer, Herr Entler, has worked with Prof. Junkers—which accounts for the corrugated sheet metal covering. The internal construction of this machine differs a little in detail from the Junkers type. The machine is of the "sporting" type and is a two-seater. The first machine was fitted with the two-cylinder opposed "Haacke" air-cooled engine of 30 h.p., which is insufficient for flight. The designer proposed to fit a 50 h.p. Siemens, but no information as to the practical success of the machine has been received. A complete description was included in the 1922 edition.

F

FOKKER.

(See Holland.)

FRIEDRICHSHAFEN.

Flugzeugbau Friedrichshafen, Bodensee.

Formed in 1912 as a branch of the Luftschiffbau Zeppelin, the Friedrichshafen Flugzeugbau was the first German aircraft works devoted solely to seaplanes.

During the War both land and sea-going aircraft were produced.

In 1917, the firm concentrated on the production of twin-engined "pusher" bombers.

The works are now engaged on motor ships and motor boats. No aircraft work has been done at them since 1918-19.

G

GOTHA.

Gothaer Waggonfabrik A.G.

The Gotha Company did not go through the early days of aviation, but as a firm of great capabilities secured success by manufacturing large quantities of proved sound aeroplane models.

In the War the name of Gotha has been chiefly associated with the twin-engined bomber, the first aircraft of that type to be employed by the Germans.

Although the Gotha works were situated in the centre of Germany, they were large contractors to the German navy.

The chief designer of the firm was Diplom-Engineer Karl E. M. Rösner, now designer at the Aero Works, Prague.

The firm have not built aircraft since 1918-19.

H

HALBERSTADT.

Berlin- Halberstädter Industrie-Werke (formerly Halberstädter Flugzeugwerke G.m.b.H.), Halberstadt.

Known before the War as Deutsche Bristol Werke.

During the war the Halberstadt firm produced some of the best German two-seater fighters of the War.

No aircraft activity since 1918-19.

HAWA.

Hannoversche Waggonfabrik Aktien Gesellschaft. Hannover-Linden.

The Hannoversche Waggonfabrik, who use "Hawa" as their trade mark, began to build aircraft in 1915. These machines became known by their introduction of the distinctive biplane-tailed machines for reducing the blind tail field of the gunner.

The firm built two commercial models since the War which were described in the 1922 volume. Apart from these the firm constructed the two famous Hannover Gliders, "Vampyr" and "Greif" in 1921 and 1922. A projected twin engined civil aircraft was designed, but was not allowed to be built under the restrictions imposed by the Allies. The chief engineer is Dipl. Ing. Herman Dorner.

HANSEATISCHE FLUGZEUGWERKE CARL CASPAR.

Hamburg, Fuhlsbüttel.

An early German pilot, Carl Caspar, consistently partook in the early German competitions.

With headquarters in Hamburg, he founded a flying school at Fuhlsbüttel.

He started the manufacture of "Hansa" Tauben monoplanes.

During the War, Caspar himself went on active service.

His aircraft works were, in 1915, combined with the Brandenburg company, but separated again later. They were then run as sub-contractors, chiefly of twin-engined Friedrichshafen bombers.

This firm no longer exists, having been liquidated in 1922.

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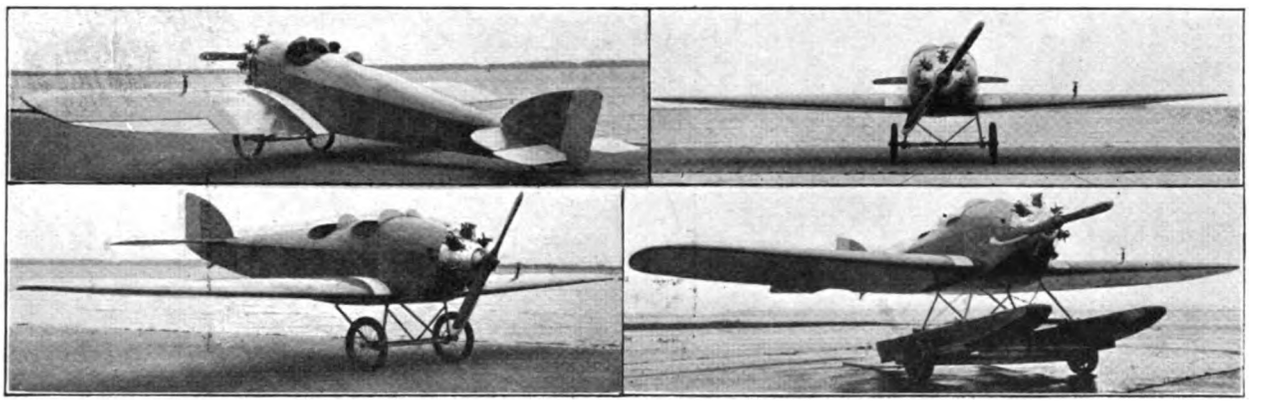
HEINKEL.



The Heinkel H.E.3, both as a land machine and as a seaplane.

Ernst Heinkel Flugzeugwerke, Warnemünde.

This new firm was founded by Heinkel after he left the Caspar Werke.

The firm has an agreement with the Svensk Aero A.B., of Stockholm, to produce Heinkel designs which it is not permitted to carry out in Germany. A seaplane of 360 h.p. is now under construction at Stockholm under this arrangement. It is known as the H.E.1.

THE HEINKEL H.E.3.

The machine known as the type H.E.3 is a cantilever monoplane of the "low-wing" type originated by Dr. Junkers, but built of wood, seating three persons, and intended for school or joy-ride purposes.

The machine is readily convertible from a seaplane to a land machine, the two undercarriages forming completely-braced structures which can be interchanged by undoing and doing up again two fastenings only.

The wings, which are in two pieces, are equally simply attached and detached. The spar roots are tapered and fit into sockets in the fuselage side. They are held in place by four bolts each, and the whole of the eight bolts are withdrawn or inserted by the movement of a handwheel in the underside of the fuselage. Tests made in the presence of an official Swedish Naval Commissioner showed that a crew of six men could change the machine from a land machine to a seaplane in 65 seconds, from seaplane to land machine in 32 seconds, could remove the wings in 24 seconds, replace them in 27 seconds, and could remove both wings and undercarriage from the land machine in 35 seconds, replace them in 49 seconds, and could carry out the same operation on the seaplane in 38 and 63 seconds respectively. With two men only, the various operations can be carried out in about six times the period required by six men.

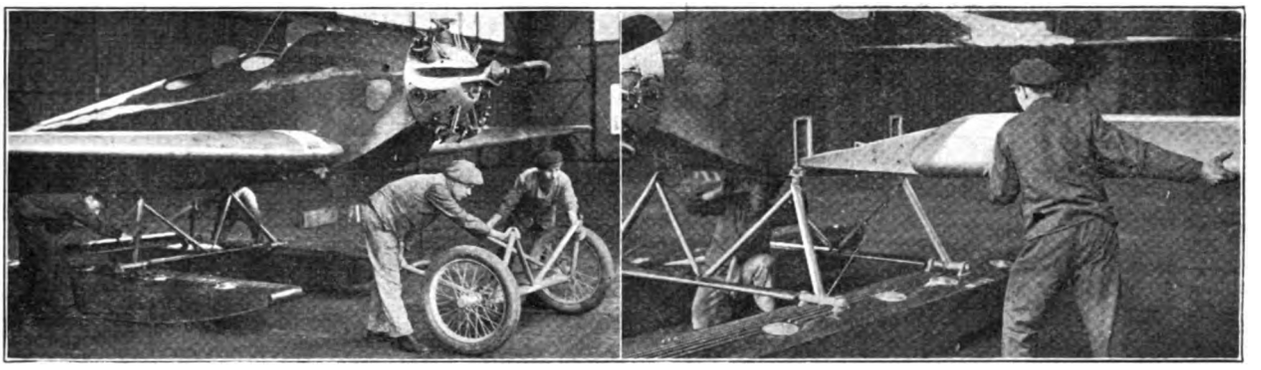
The fuselage is three-ply covered, and contains seats for pilot and one passenger side-by-side forward, and a single seat—offset to starboard—behind. The engine is one of the new 7-cylinder Siemens-Halske air-cooled radials of 80 h.p.

A removable cover for the cockpits may be fitted to this machine.

The main dimensions are tabulated below :—

Specification of the Heinkel H.E.3.

	Land machine.	Seaplane.
Span ..	..10.4 m. (34 ft. 1 in.).	10.4 m. (34 ft. 1 in.).
Length ..	..7.8 m. (25 ft. 7 in.).	7.8 m. (25 ft. 7 in.).
Wing area	..10.4 sq. m. (118 sq. ft.).	10.4 sq. m. (118 sq. ft.).
Height ..	..2.35 m. (7 ft. 8 in.).	2.5 m. (8 ft. 2½ in.).
Weight empty	480 kgs. (1,056 lbs.).	520 kgs. (1,145 lbs.).
Weight loaded	800 kgs. (1,760 lbs.).	840 kgs. (1,850 lbs.).
Wing loading	..46.5 kgs./sq. m. (14.9 lbs./sq. ft.).	49 kgs./sq. m. (15.6 lbs./ sq. ft.).
Power loading	10 kgs./h.p. (22 lbs./ h.p.).	10.6 kgs./h.p. (23.3 lbs./ h.p.).
Range ..	..620 km. (380 miles).	600 km. (370 miles).
Speed ..	..150 km.h. (93 m.p.h.).	145 km.h. (90 m.p.h.).
Climb to 1,000m. (3,280 ft.)	..6 mins.	7 mins.



Changing undercarriage on the Heinkel H.E.3.

J

JUNKERS.

Junkers Werke, Dessau.

Professor Junkers, the inventor and manufacturer of opposed piston Diesel engines, patented in 1909 a novel form of thick wing cantilever monoplane, and has since designed and experimented with a highly interesting fuel injection opposed cylinder aero-engine.

He founded this firm in 1915 to introduce new ideas, particularly the development of all-metal cantilever machines. In 1921 he founded the Junkers Luftverkehr, an Air Line organisation.

The early products of the Junkers works have been dealt with in the official reports, printed in an earlier edition, on captured specimens, viz., the biplane contour fighter and its also all-duralumin companion single-seater monoplane scout edition.

THE JUNKERS TYPE F.

The six-seater commercial type F Junkers monoplane described in previous issues of this annual has been subjected to certain modifications of detail in order that it may comply with the conditions which have been enforced on German commercial aircraft by the Allied Powers. Chief among these alterations has been the substitution for the original "high altitude type" of B.M.W. engine of a modified variant of the same design which however is not super-compressed, but gives 200 h.p.

The machine is now built as a standard, with fittings which allow both the usual land undercarriage and a duralumin twin float undercarriage, to be interchanged one for the other. The following specifications give data as to this machine, both as a land machine and as a seaplane.

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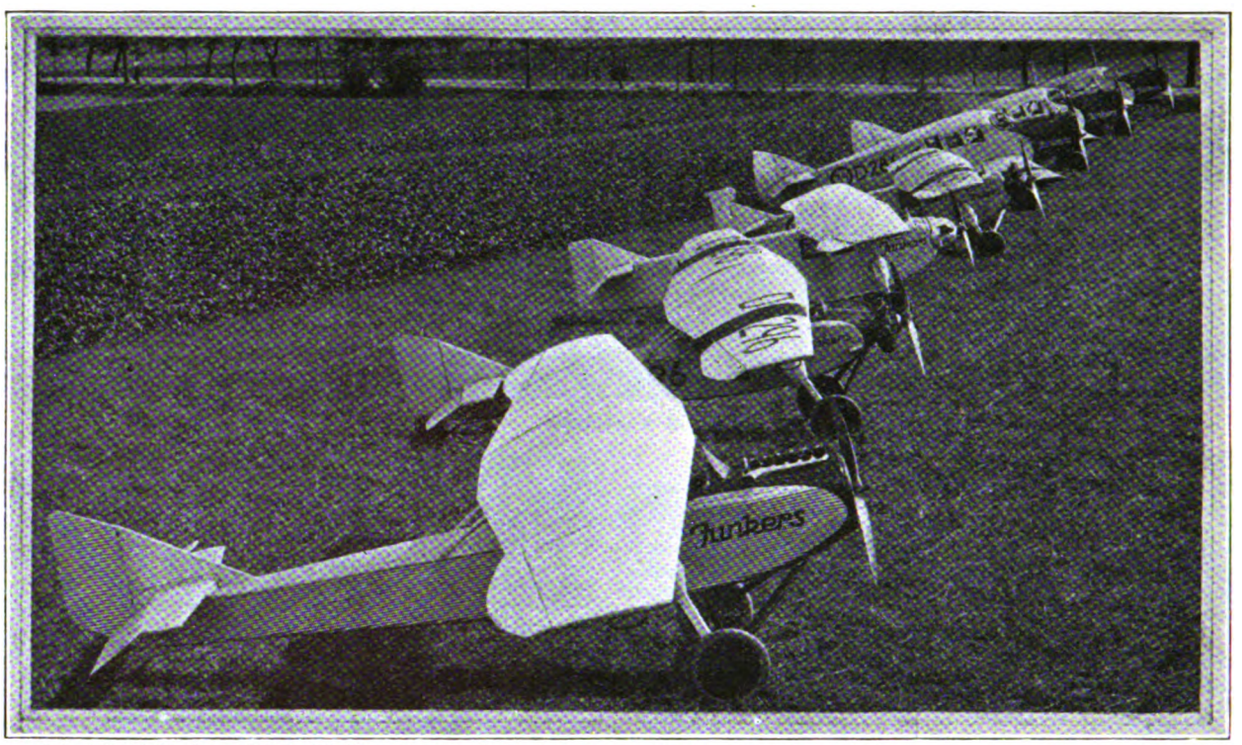
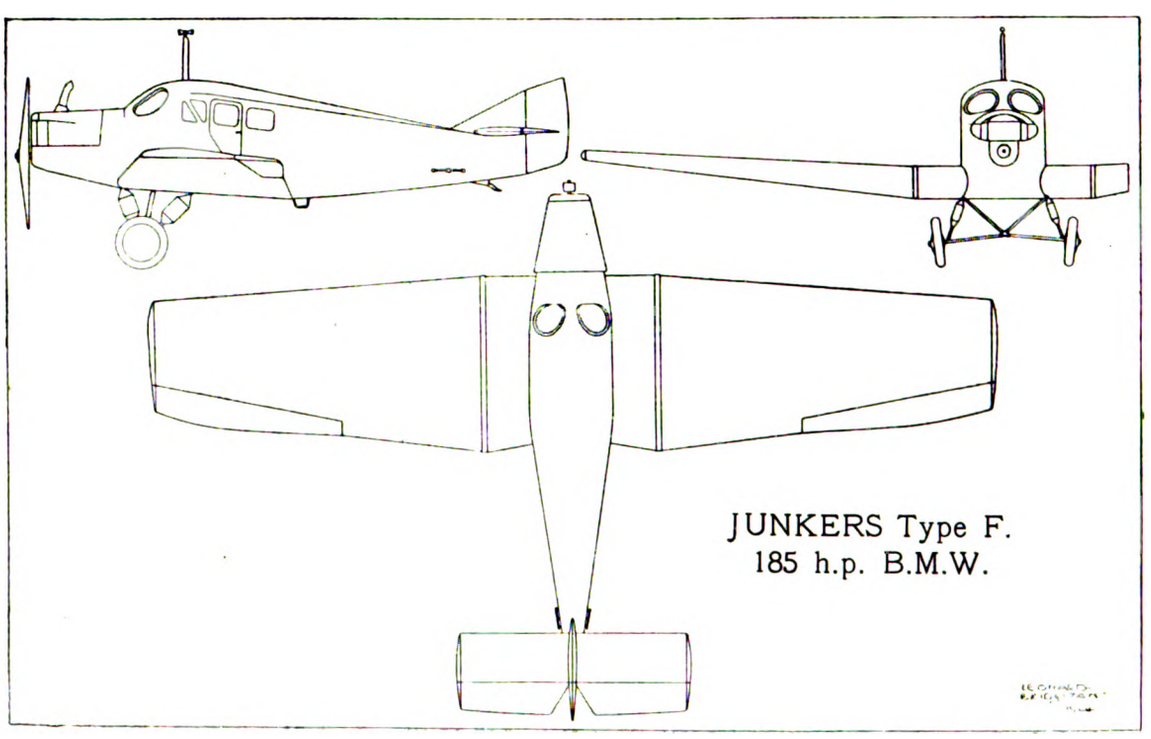
JUNKERS*—*continued.



A batch of Junkers All-Metal Monoplanes of divers types.

The Junkers type F. Limousine (185 h.p. B.M.W. engine).



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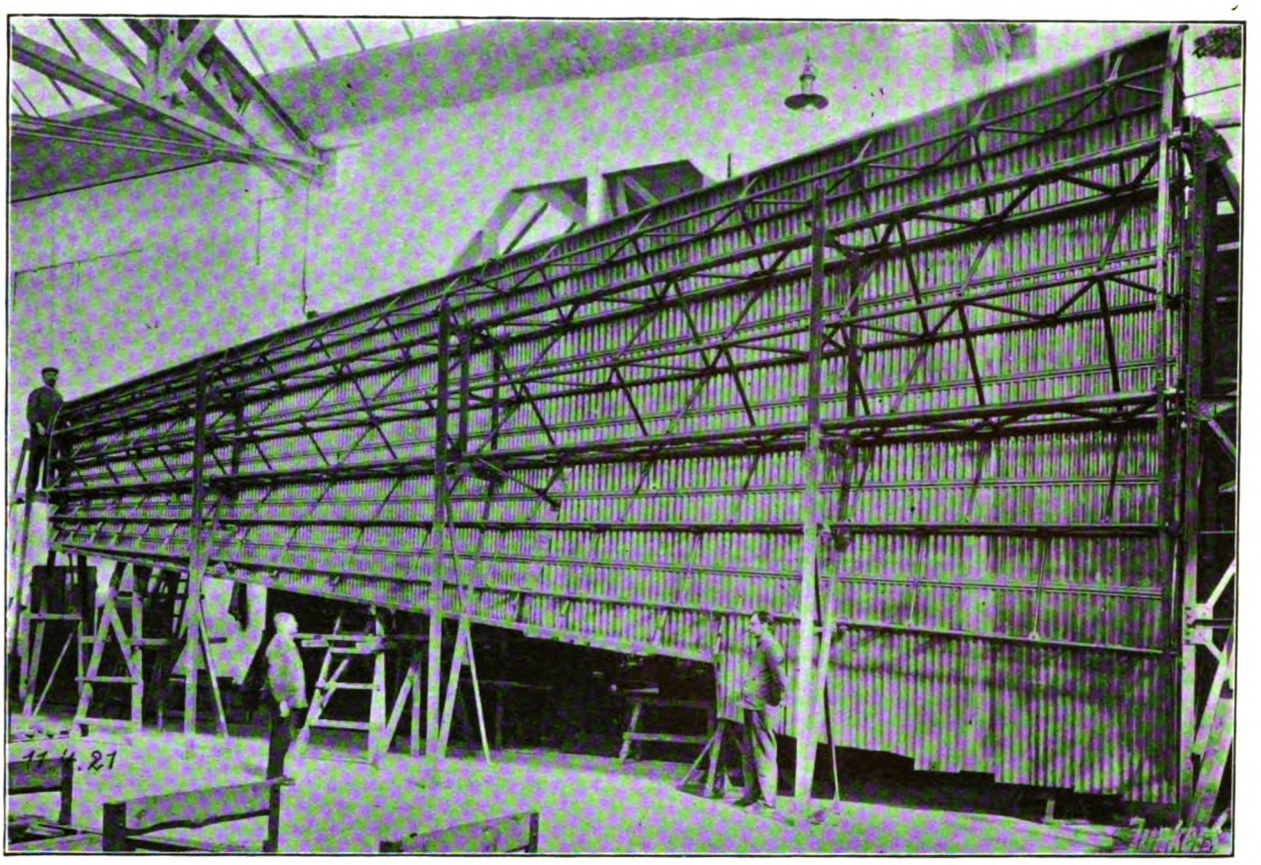


A typical example of Junkers Construction. Partly covered wing of a large Passenger Carrier which was not allowed to be completed by the Commission of Control.

Specification of the Junkers Type F or J13.

	As Land Machine.	As Seaplane.
Span	17.80 m. (58 ft. 8 in.).	17.80 m. (58 ft. 8 in.).
Length	9.60 m. (31 ft. 6 in.).	10.30 m. (33 ft. 9½ in.).
Height	3.30 m. (10 ft. 9 in.).	3.50 m. (11 ft. 5 in.).
Max. chord	3.00 m. (9 ft. 10 in.).	3.00 m. (9 ft. 10 in.).
Engine	Junkers built B.M.W., 185 h.p.	
Weight empty	1,1 0 kgs. (2,530 lbs.).	1,300 kgs. (2,860 lbs.).
Weight loaded	1,730 kgs. (3,850 lbs.).	1,900 kgs. (4,180 lbs.).
Fuel capacity	180-260 litres (40-60 galls.).	
Max. speed	170 km.h. (106 m.p.h.).	165 km.h. (102 m.p.h.).
Cruising speed	140 km.h. (85 m.p.h.).	135 km.h. (82 m.p.h.).
Landing speed	75-80 km.h. (47-50 m.p.h.).	80-85 km.h. (50-53 m.p.h.).
Range in hours	5 hours.	5 hours.

THE THREE-SEATER MONOPLANE TYPE K.

This is a small three-seater, carrying two passengers in a cabin and a pilot in front. Experimental work on this particular type has occupied some 15 months, and has included tests to discover a satisfactory engine, experiments with wings arranged at the bottom of the fuselage as in previous Junkers' monoplanes, and finally with the present arrangement.

Like the previous Junkers, the machine is of all-metal structure, using the characteristic corrugated thin sheet duralumin covering. The wing, of thick section, built on multiple tubular spars, is of 11 metres span and is built in one piece. It is attached to the top of the fuselage, and its leading edge is cut out to accommodate the pilot's head.

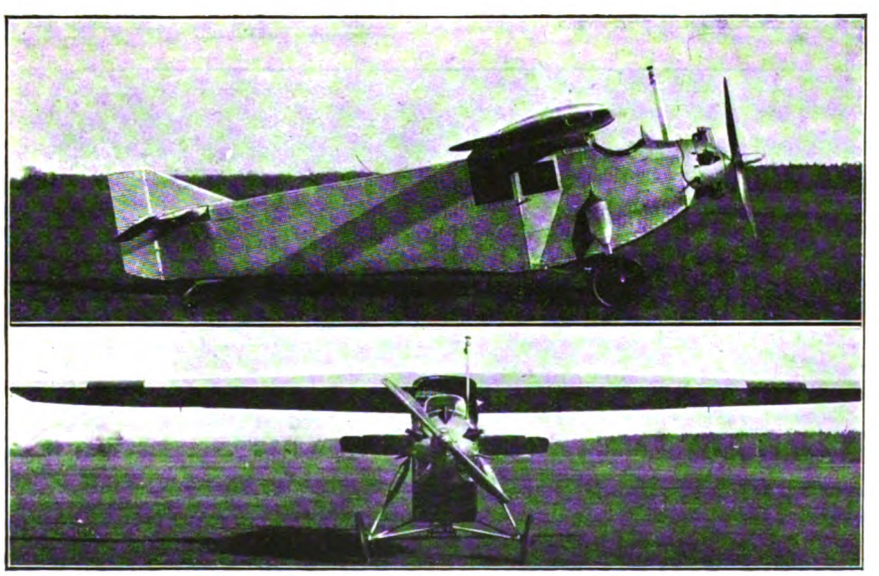
The wing is also recessed on its under surface to accommodate the petrol tank—which is fixed actually to the top of the fuselage behind the pilot, but is enclosed by the wing when this is in position.

Behind the pilot and under the wing is a passenger cabin, large enough to accommodate two passengers, with a side entrance on the starboard side.

The undercarriage consists of two axles, hinged to a sort of rudimentary keel below the breast of the fuselage, a pair of thrust tubes, lying behind the axle, but also approximately horizontal, and a nearly vertical telescopic strut, fitted with shock absorbers fixed to the axle ends and to the fuselage side.

The engine is of the 50 h.p. 5-cylinder or 70 h.p. 7-cylinder radial air-cooled Siemens-Halske type, fitted to the nose of the fuselage, and very thoroughly cowled in. The direct driven airscrew carries on its boss a forward projecting cylindrical nose of some length, which is meant to protect the engine from contact with the ground in case of the machine standing on its nose.

The machine is designed for high-speed special transport work—such as newspaper work and the transport of small urgent goods. Normally with full tanks it carries one passenger and a fair amount of baggage. With reduced fuel or with little or no baggage, two passengers may be carried. The machine is now fitted with a Junkers all-metal airscrew.



The Junkers Type K Three-seater Monoplane (Siemens-Halske 55 h.p. or 70 h.p.)

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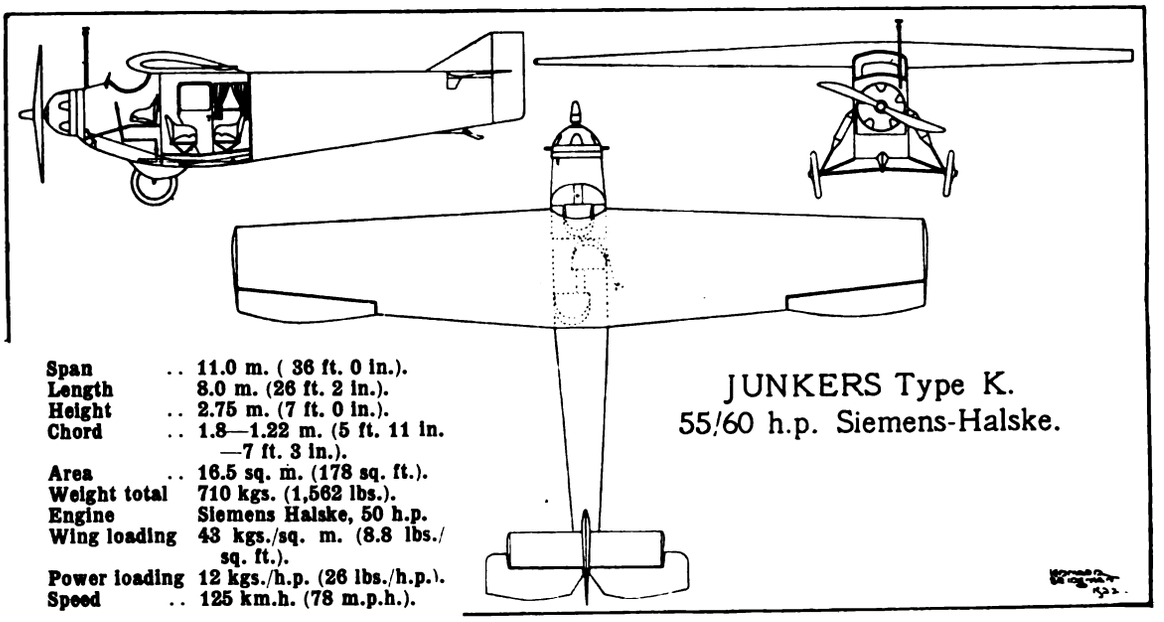
JUNKERS—*continued.*

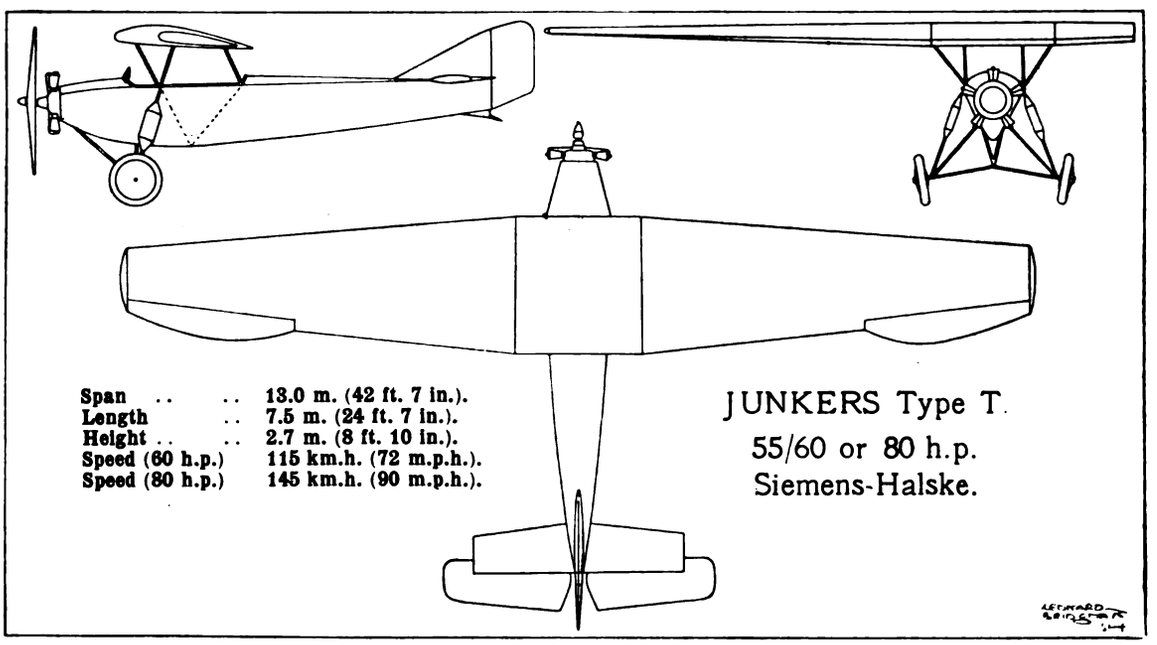


Span	11.0 m. (36 ft. 0 in.).
Length	8.0 m. (26 ft. 2 in.).
Height	2.75 m. (7 ft. 0 in.).
Chord	1.8—1.22 m. (5 ft. 11 in. —7 ft. 3 in.).
Area	16.5 sq. m. (178 sq. ft.).
Weight total	710 kgs. (1,562 lbs.).
Engine	Siemens Halske, 50 h.p.
Wing loading	43 kgs./sq. m. (8.8 lbs./ sq. ft.).
Power loading	12 kgs./h.p. (26 lbs./h.p.).
Speed	125 km.h. (78 m.p.h.).

JUNKERS Type K.
55/60 h.p. Siemens-Halske.

THE JUNKERS TYPE T.

A two or three-seater "Parasol" monoplane for school, joy-ride and general sporting purposes. Built to standard Junkers' all-metal methods of construction. For school work it is fitted with dual control and two seats, and may be supplied with either the 60 h.p. or the 80 h.p. Siemens Halske air-cooled radial engine, or with the new Junkers 6-cylinder vertical air-cooled engine of 90 h.p. With the latter two engines it may be fitted as a three-seater.



Span	13.0 m. (42 ft. 7 in.).
Length	7.5 m. (24 ft. 7 in.).
Height	2.7 m. (8 ft. 10 in.).
Speed (60 h.p.)	115 km.h. (72 m.p.h.).
Speed (80 h.p.)	145 km.h. (90 m.p.h.).

JUNKERS Type T.
55/60 or 80 h.p.
Siemens-Halske.

A Junkers Type T with the Junkers 6-cylinder air-cooled engine.

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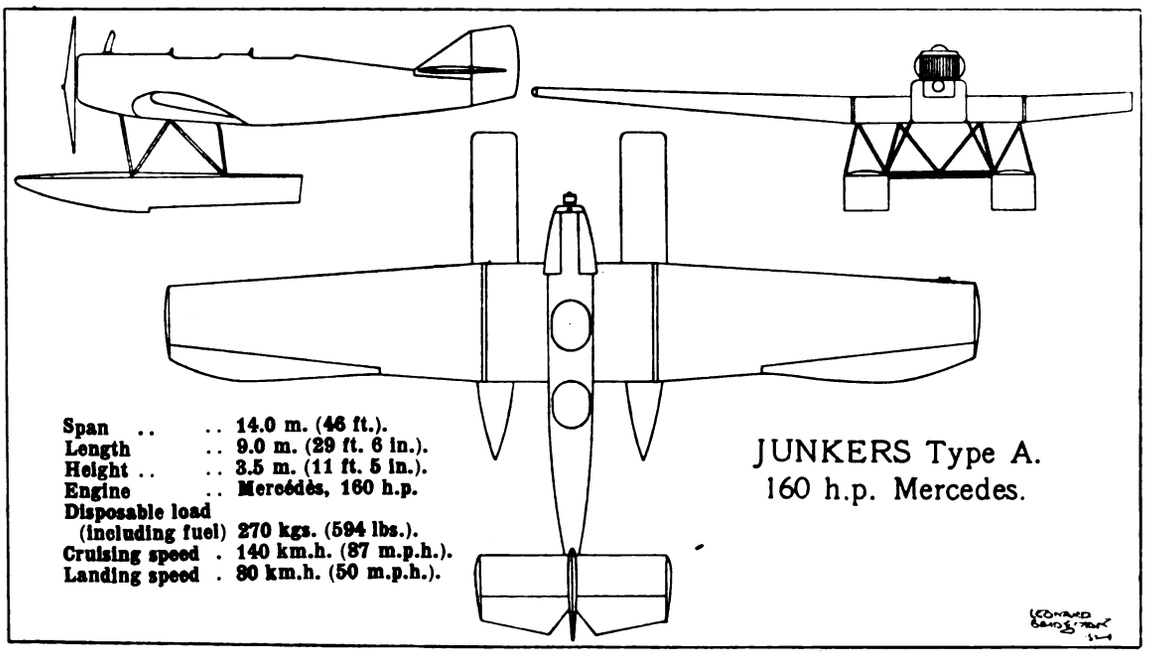
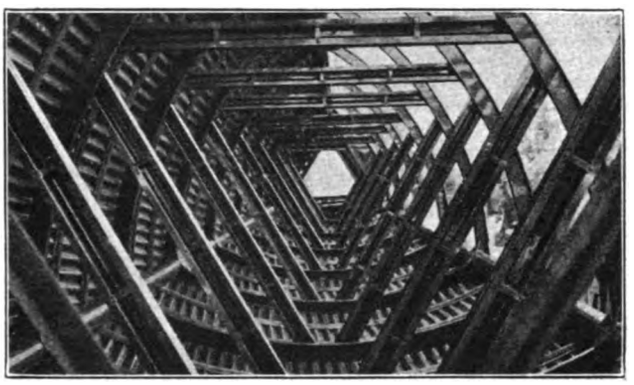

Span .. .. 14.0 m. (46 ft.).
Length .. 9.0 m. (29 ft. 6 in.).
Height .. .. 3.5 m. (11 ft. 5 in.).
Engine .. Mercédès, 160 h.p.
Disposable load (including fuel) 270 kgs. (594 lbs.).
Cruising speed . 140 km.h. (87 m.p.h.).
Landing speed . 80 km.h. (50 m.p.h.).
JUNKERS Type A.
160 h.p. Mercedes.

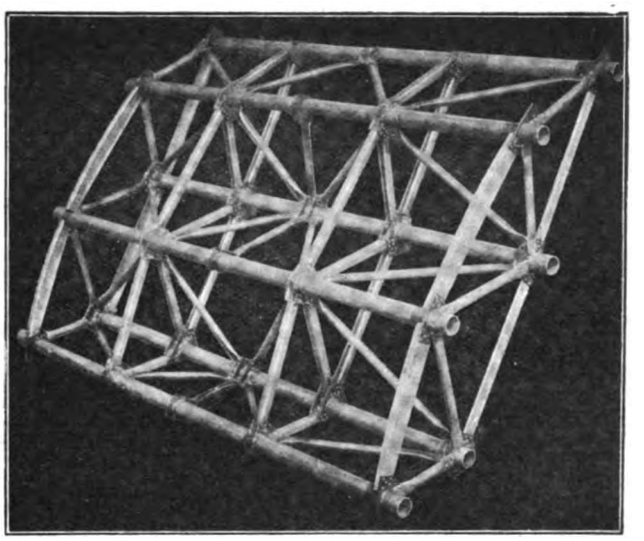
THE JUNKERS TYPE A SEAPLANE.

An open two-seater twin-float seaplane of the normal Junkers low-wing type, produced in 1923 and passed by the Commission Aéronautique Inter-Allié as a permissible type.

The firm has also produced a hydroglisseur of characteristic Junkers duralumin structure, fitted with the Junkers 6-cylinder air-cooled engine and driven by airscrew. From the general form of this apparatus it might be inferred that the development of a Junkers flying-boat is not improbable.



Interior of a large Junkers fuselage.



The characteristic wing root structure of a Junkers Monoplane. This structure is built into the fuselage.

The Junkers Type A Seaplane.

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K

KLAWA.

Klatte-Wahrlich Werke, G.m.b.H., Berlin-Johannisthal.

This new firm, founded 1922, propose to build small aircraft, both of the glider and engined type, for school, passenger and sporting purposes. Up to the time of writing none of their products have materialized.

L

L.F.G.

Luft Fahrzeug Gesellschaft m.b.H., Berlin W62, Kleiststrasse 8, Head Office.

Seaplane Works : Stralsund.

Airship Works : Seddin, bei Stolp, Pommern.

This firm is one of the best organised of the German aircraft companies. Built before the War aeroplanes at Adlershof, near Johannisthal, and Parseval airships at Bitterfeld. Between 1915 and 1918 aeroplanes were also built at the Exhibition Hall, on the Kaiserdamm, at Charlottenburg. The Adlershof works are now abandoned, and only the Stralsund yard is now engaged on aircraft work.

The managing director of the firm is Major D. Kehler. The chief designer and manager of the Stralsund works is Marine-baumeister a. d. G. Baatz, who, after Junkers, Dornier and Rohrbach, has been largely responsible for German all-metal aircraft development.

The early type aeroplanes were a "Taube" monoplane and an "Arrow" biplane, on which Bruno Langer put up the first German duration record of 14 hours in 1914.

Tractor biplanes and a single-engined twin-screw pusher were built 1914-15.

In 1915, a machine known as the L.F.G. "Walfisch" (whale) was produced. This machine, fitted with the 160 h.p. Mercedes engine, was the fastest two-seater in Germany from 1915 to 1917, and would even to-day be regarded as aerodynamically of modern design.

In 1915-16, about 18 types of single-seaters were built.

STRALSUND SEAPLANES.

During the war the Stralsund yard built float seaplanes of the tractor type. The designer, G. Baatz, at this yard developed a system of all-metal construction and produced a number of interesting seaplanes and flying-boats.

THE L.F.G. "PUTBUS."

The L.F.G. "Putbus" is a small single-seater float monoplane seaplane developed primarily as a ship-aeroplane.

All the parts, with the exception of the front part of the fuselage containing the engine, petrol tank and engine controls, are constructed to pack into five sheet-steel cylinders. This machine was described in the 1922 volume of "All the World's Aircraft."

THE V.23, "ANKLAM."

This is a three-seater cantilever monoplane fitted with the 50/60 h.p. Siemens-Halske air-cooled engine. The most noticeable features are the arrangement of the wing at the bottom of the fuselage, as in the Junkers type, and the clover leaf seating arrangement—two seats side by side in front and one behind. The machine is intended for school and "joyride" work.

Specification of the V23.

Span	**10.10 m. (36 ft.).**
Length	**5.80 m. (19 ft.).**
Height	**2.10 m. (6 ft. 10 in.).**
Weight empty	**290 kgs. (638 lbs.).**
Weight loaded	**590 kgs. (1,298 lbs.).**
Fuel capacity	**80 litres (17½ galls.).**
Range	**3½ hours—500 kms. (310 miles).**
Speed	**150 km.h. (93 m.p.h.).**
Climb to 1,000 m. (3,280 ft.).	**10 mins.**

THE V23a, "ANKLAM a."

This is a two-seater, differing from the V23 in having the wing on top of the fuselage. The general form of wings, fuselage and tail unit are extremely similar in the two cases. It is therefore extremely difficult to account for the very greatly decreased performance of the V23a, as compared with that of the V23, except on the assumption that an engine of lower power is used in the latter case.

This is confirmed by the figures showing an increased duration of flight with a reduced petrol capacity.

Specification of the V23a.

Span	**10.10 m. (36 ft.).**
Length	**6.34 m. (20 ft. 10 in.).**
Height	**2.10 m. (6 ft. 10 in.).**
Weight empty	**300 kgs. (660 lbs.).**
Weight loaded	**530 kgs. (1,166 lbs.).**
Fuel capacity	**50 litres (11 galls.).**
Range	**4 hours—500 km. (310 miles).**
Speed	**125 km.h. (78 m.p.h.).**
Climb to 1,000 m. (3,280 ft.).	**10 mins.**

THE V27 "DEMMIN."

This is a four passenger commercial machine with the 185 h.p. B.M.W. engine. It is of the cantilever type, with a deep fuselage containing the passengers' cabin. The pilot and mechanic are seated side-by-side ahead of the wing, separated from the engine by a fireproof bulkhead of duralumin. A second bulkhead is interposed between the cockpit and the cabin. This latter seats four in two sets of two side-by-side, facing forward.

The wings are heavily tapered in plan form. The general arrangement is clear from the scale drawing reproduced—which also gives all available dimensions.

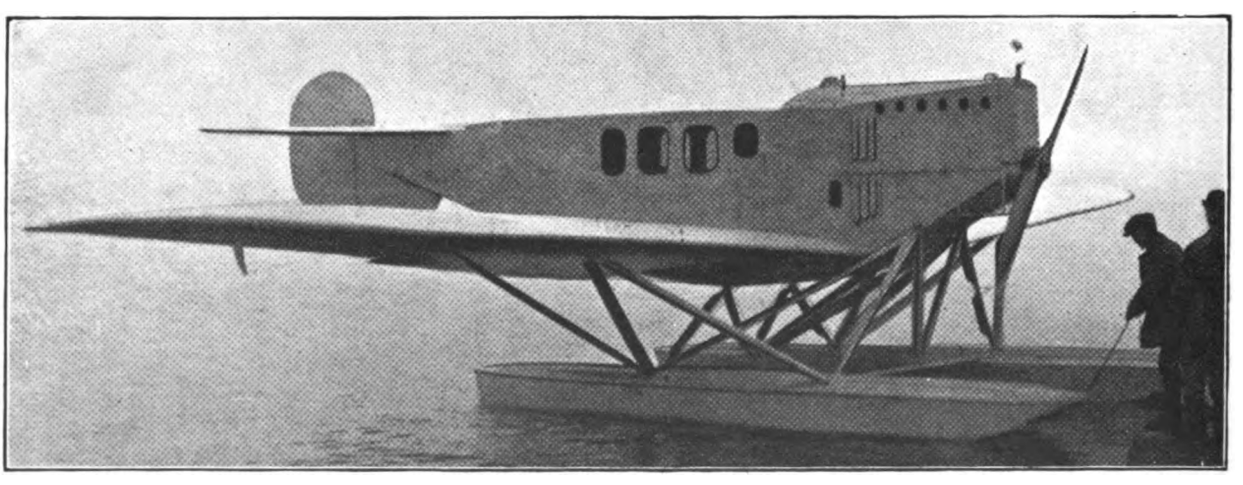
This machine is built both in all-metal and in wooden construction.

THE V28 "DÄNHOLM."

This is to all intents and purposes the V23 above described, on floats. The general arrangement is clearly shown in a scale drawing, which includes also the general specification.

THE L.F.G. "STETTIN."

This machine may be regarded as a twin-engined development of the "Anklam," which has been previously described. It is a twin float cantilever monoplane with the wing at the bottom of the fuselage, and with the tail raised well above the wing.



An L.F.G. All-Metal Commercial Seaplane.

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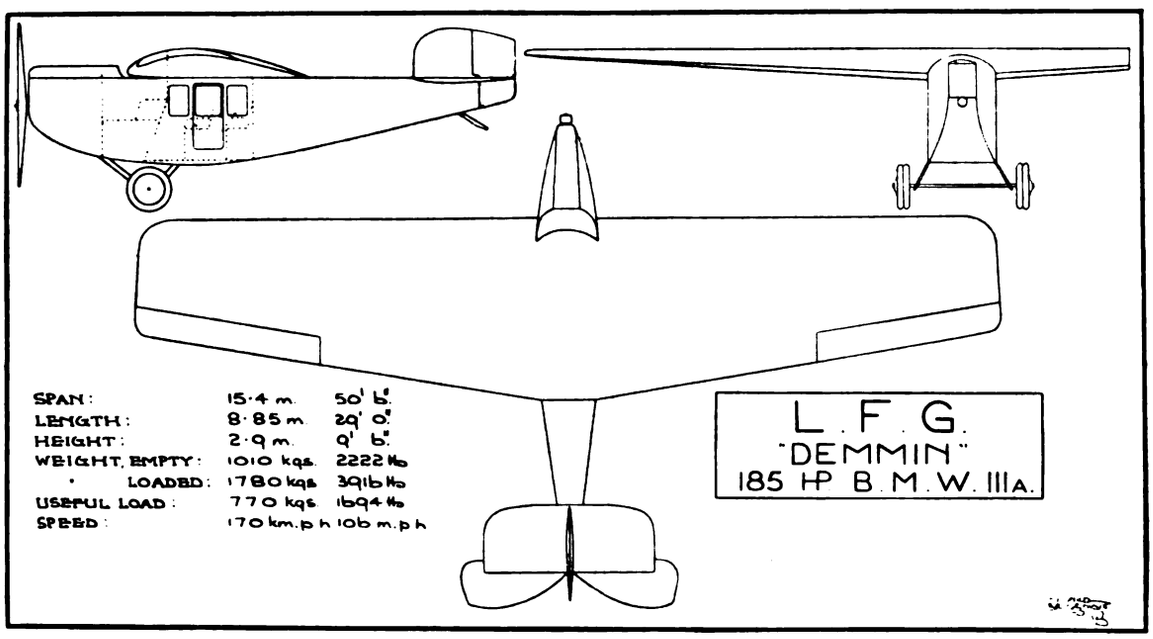
L.F.G.—continued.


SPAN: 15·4 m. 50' 6"
LENGTH: 8·85 m. 29' 0"
HEIGHT: 2·9 m. 9' 6"
WEIGHT, EMPTY: 1010 kgs. 2222 lb
" LOADED: 1780 kgs. 3916 lb
USEFUL LOAD: 770 kgs. 1694 lb
SPEED: 170 km.p.h. 106 m.p.h.
L.F.G.
"DEMMIN"
185 HP B.M.W. IIIa.

The fuselage is cut off short just ahead of the leading edge of the wings and carries in its nose side-by-side seats for pilot and mechanic, followed by a cabin containing seats for 11 passengers.

Two engines—each 185 h.p. Benz—are carried in nacelles on the leading edge, with the airscrews arranged to overlap the fuselage just ahead of its forward extremity.

The arrangement and the specification in metric units are shown in a drawing. The English equivalents of the metric figures are given below :—

Specification of the L.F.G. Stettin.

Span	**72 ft. 3 in.**
Length	**45 ft.**
Height	**11 ft. 7 in.**
Chord, max.	**14 ft. 9 in.**
Chord, min.	**11 ft. 6 in.**
Wing area	**860 sq. ft.**
Weight empty	**4,840 lbs.**
Weight loaded	**7,480 lbs.**
Wing loading	**8.7 lbs./sq. ft.**
Power loading	**20 lbs./h.p.**
Speed	**102 m.p.h.**
Range	**3 4 hours—345 miles.**

THE L.F.G. RÜGEN.

This is a twin-engine all-metal passenger flying-boat. It is fitted with a hull of very great beam—sufficient to allow the suppression of wing-tip floats. The cantilever wing, of generally similar form to that of the "Stettin," has its leading edge nearly at the extreme bow of the hull. Behind the wing, the hull sweeps up considerably—thus keeping the tail well clear of the water.

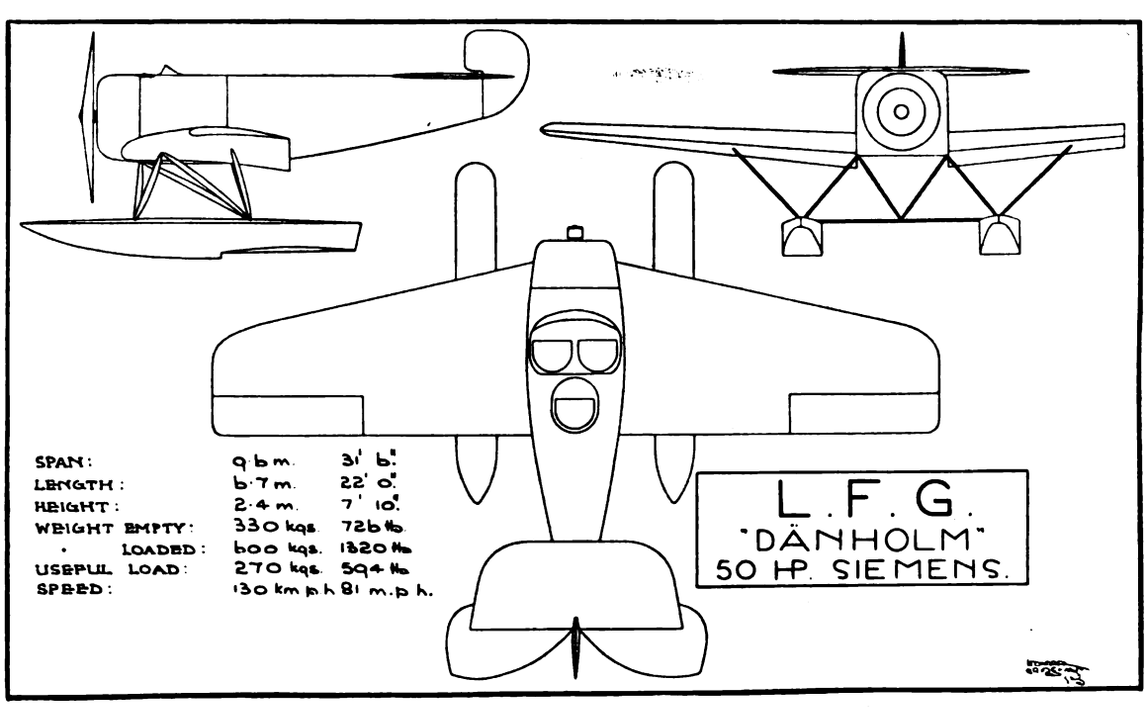
The two engines—260 h.p. Maybachs—are arranged very close together on the wing and again the airscrews overlap the hull in end elevation.

Two side-by-side seats are arranged in the bows—and the entirely enclosed cabin under the wings provides seats for 15 passengers, plus a considerable space for luggage, etc.

The drawing reproduced shows the form and gives the main dimensions, etc. The English equivalents of the metric measures are given below :—

Specification of the L.F.G. Rügen.

Span	**92 ft.**
Length	**44 ft. 9 in.**
Height	**10 ft. 11 in.**
Chord, max.	**19 ft. 8 in.**


SPAN: 9·6 m. 31' 6"
LENGTH: 6·7 m. 22' 0"
HEIGHT: 2·4 m. 7' 10"
WEIGHT EMPTY: 330 kgs. 726 lb
" LOADED: 600 kgs. 1320 lb
USEFUL LOAD: 270 kgs. 594 lb
SPEED: 130 km.p.h. 81 m.p.h.
L.F.G.
"DÄNHOLM"
50 HP. SIEMENS.

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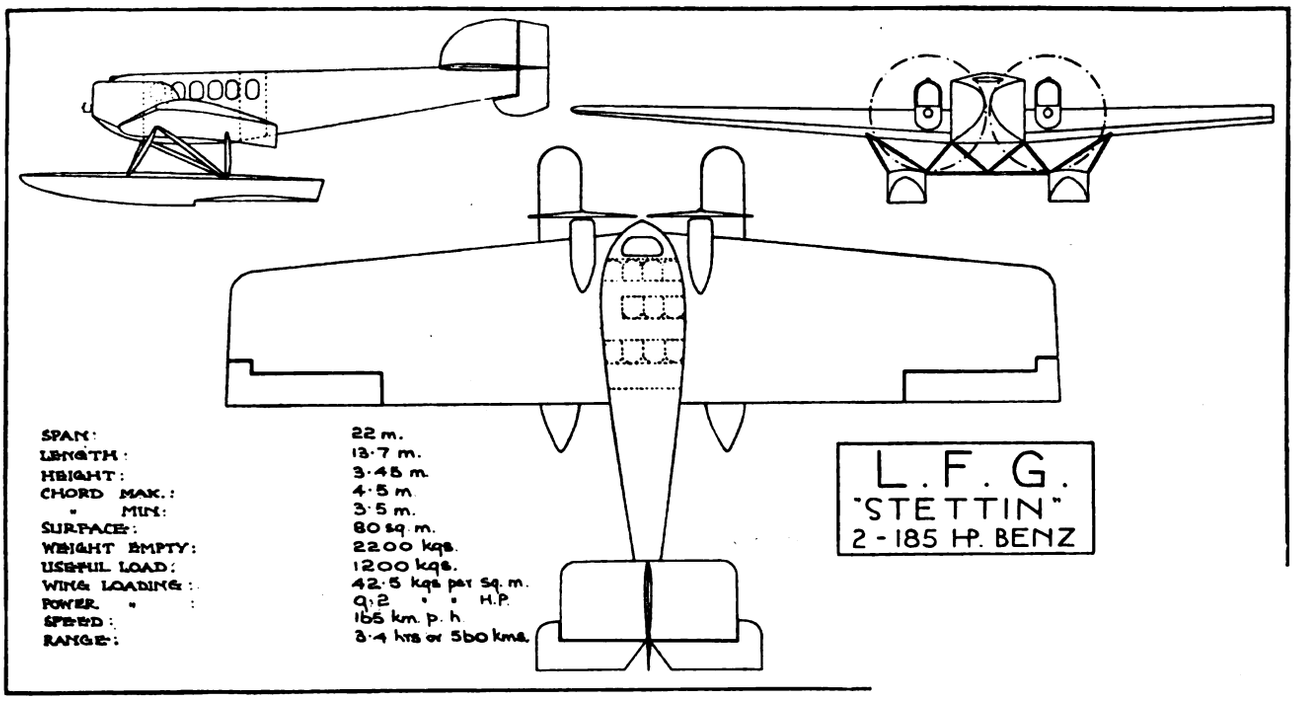
***L.F.G.**—continued.*


SPAN: 22 m.
LENGTH: 13·7 m.
HEIGHT: 3·45 m.
CHORD MAX.: 4·5 m.
" MIN: 3·5 m.
SURFACE: 80 sq. m.
WEIGHT EMPTY: 2200 kgs.
USEFUL LOAD: 1200 kgs.
WING LOADING: 42·5 kgs per sq. m.
POWER " : 9·2 " " H.P.
SPEED: 165 km. p. h.
RANGE: 3·4 hrs or 560 kms.
L. F. G.
"STETTIN"
2 - 185 HP. BENZ

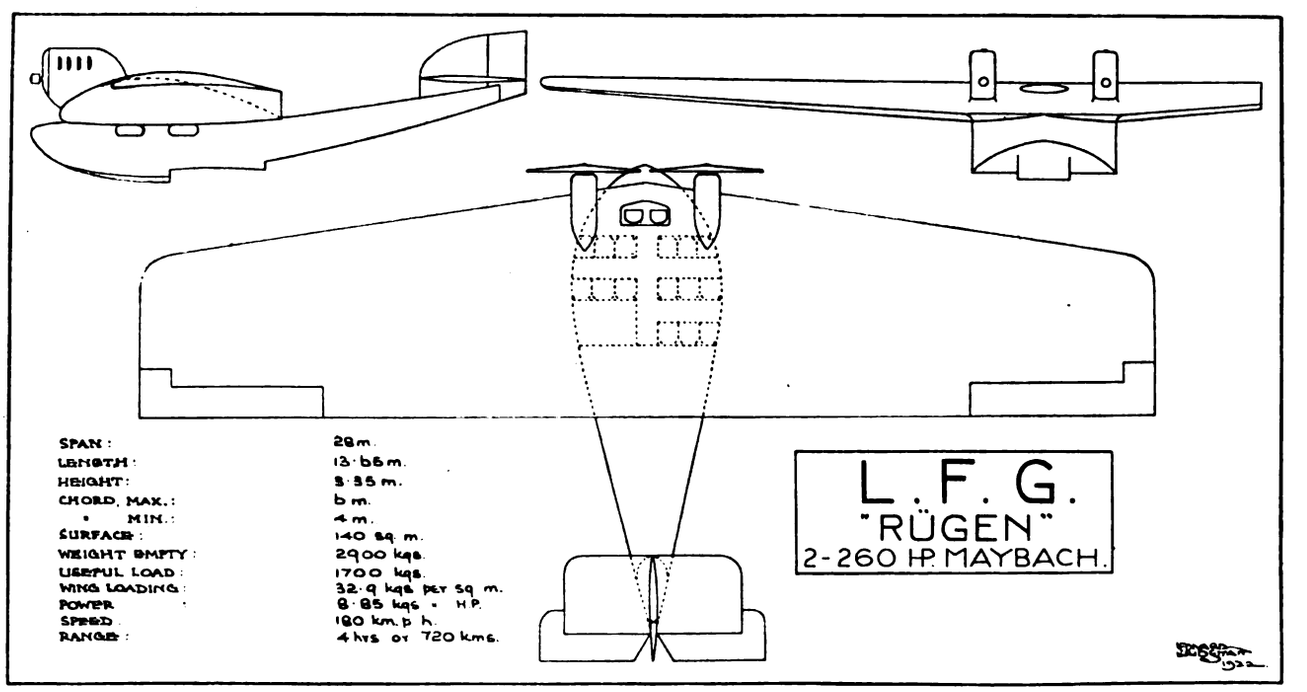
Chord, min.	**13 ft. 1½ in.**
Wing area	**1,500 sq. ft.**
Weight empty	**6,380 lbs.**
Total load	**3,740 lbs.**
Wing loading	**6.75 lbs./sq. ft.**
Power loading	**19.5 lbs./h.p.**
Speed	**112 m.p.h.**
Range	**4 hours—450 miles.**

L.V.G.

Luft Verkehrs Gesellschaft Arthur Müller, Johannisthal, Berlin.

Was one of Germany's largest aircraft works. The firm ran in its early days an air traffic service with Parseval airships, from which the name of Air Traffic Co. Ltd. was taken.

No aircraft have been constructed since 1921.



M

MARK.

Stahlwerk Mark, Breslau.

An engineering firm which has undertaken the quantity production of the Rieseler sports monoplanes. See Rieseler.

Their activities in aeronautics are ascribed to purely advertising purposes.

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N

NORDFLUG.

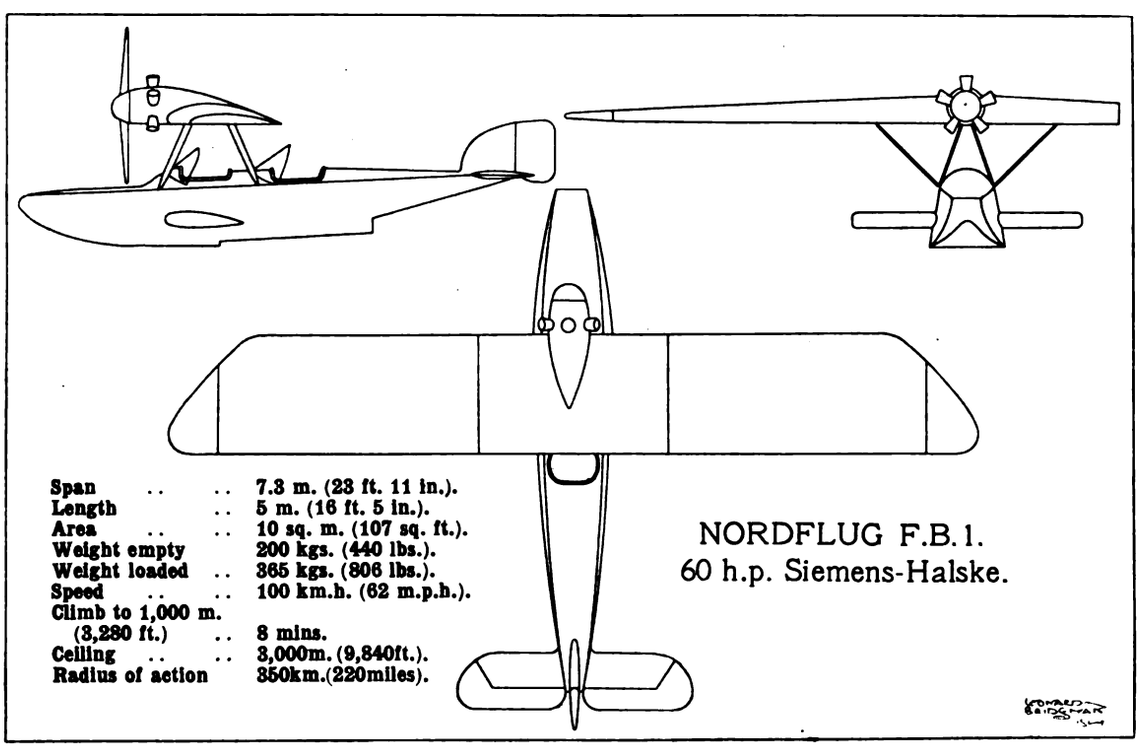
Nordflug Werke, G.m.b.H., Berlin-Teltow.

The Nordflug F.B.1. (60 h.p. Siemens engine.)

This firm were successors to the defunct Union firm. They built seaplanes as subcontractors during the war, under the style of Noeddeutsche Flugzeugwerke.

THE F.B.1.

The firm built in 1923 and exhibited at the Gothenburg Exhibition of that year, a small three-seater monoplane flying-boat. The machine has a cantilever wing carried above the hull, with the engine mounted in the leading edge of the centre section. The hull is fitted with wing-form side-floats and the crew are seated below the wing and behind the airscrew. In form and general arrangement it greatly resembles the Dornier "Libelle," but is of wooden construction. Somewhat unusual wing tip ailerons are fitted.



Span	7.3 m. (23 ft. 11 in.).
Length ..	5 m. (16 ft. 5 in.).
Area	10 sq. m. (107 sq. ft.).
Weight empty	200 kgs. (440 lbs.).
Weight loaded ..	365 kgs. (806 lbs.).
Speed	100 km.h. (62 m.p.h.).
Climb to 1,000 m. (3,280 ft.) ..	8 mins.
Ceiling	3,000m. (9,840ft.).
Radius of action	350km.(220miles).

R

RIESELER.

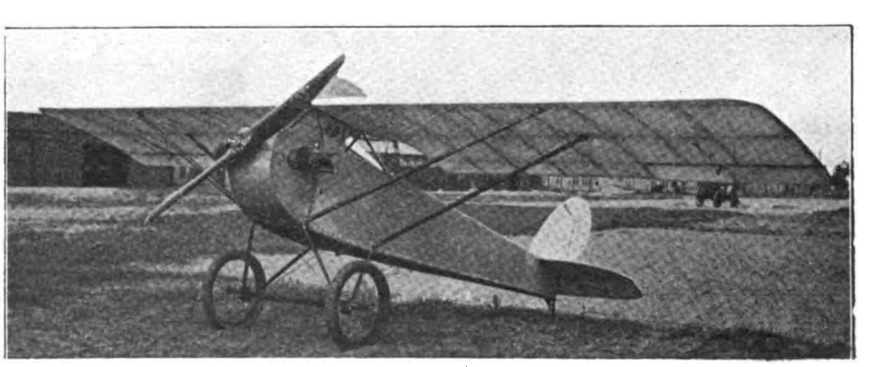
Kleinflugzeugbau Rieseler, Berlin, Johannisthal.

This is a new firm, founded in 1919.

Designed and built a little sporting monoplane illustrated and described in the 1922 volume. Since then, the machine has been modified by fitting it with quickly detachable wings and arrangements whereby the whole machine can be packed for transport along a road. Photographs here reproduced show the machine in this modified version.

Production of this type has been undertaken by "Stahlwerk Mark," at Breslau.

The firm has developed a similar two-seater type, "R.IV/23," fitted with 50 h.p. Mercedes engine and also with the 55 h.p. Siemens-Halske engine.



The Rieseler Monoplane. Type "Mark R.III/22."

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RIESELER—continued.

The Rieseler R.V. 23 machine.

Specification of the Rieseler "R.III/23" Sport Machine.

Span	7.06 m. (23 ft. 2 in.).
Length	5.04 m. (6 ft. 7 in.).
Area	11.4 sq. m. (123 sq. ft.).
Weight loaded	230 kgs. (506 lbs.).
Engine	Haacke, 35 h.p.
Wing loading	20 kgs./sq. m. (4.1 lbs./sq. ft.).
Power loading	7.7 kgs./h.p. (15.5 lbs./h.p.).
Max. speed	95 km.h. (59 m.p.h.).
Landing speed	45 km.h. (25 m.p.h.).
Climb to 1,000 m. (3,780 ft.)	4 mins.

Specification of the R.IV/23 Type.

Span	10.0 m. (32 ft. 10 in.).
Length	6.0 m. (19 ft. 8 in.).
Wing area	14 sq. m. (145 sq .ft.).
Loaded weight	510 kgs. (1,122 lbs.).
Engine	Mercédès or Siemens-Halske, 55 h.p.
Wing loading	36.4 kgs./sq. m. (7.7 lbs./sq. ft.).
Power loading	9.3 kgs./h.p. (20 lbs./h.p.).

THE RIESELER R.V/23.

A very similar machine to the R.IV, but arranged to seat four—two side-by-side—in an open cockpit behind the wings and two in a cabin below the wings. The engine is a 6-cylinder 100 h.p. Mercédès.

Specification.

Span	14.25 m. (47 ft. 7 in.).
Length	7.90 m. (25 ft. 11 in.).
Height	3.35 m. (10 ft. 11 in.).
Wing area	27 sq. m. (290 sq. ft.).
Weight empty	800 kgs. (1,760 lbs.).
Weight loaded	1,280 kgs. (2,816 lbs.).
Engine	Mercédès, 100 h.p.
Wing loading	47.5 kgs./sq. m. (9.7 lbs./sq. ft.).
Power loading	12.8 kgs./h.p. (28.2 lbs./h.p.).
Speed	150 km.h. (93 m.p.h.).
Climb to 1,000 m. (3,280 ft.)	8 mins.
Endurance	4 hours.

ROHRBACH.

Rohrbach Metall Flugzeugbau G.m.b.H., Berlin S.W.68, Friedrichstr. 203.

This firm was founded in July, 1922, to carry on the designing and construction of all-metal aircraft, particularly of the multi-engined type to the designs of Dr. Ing. Rohrbach, who, while connected with the Zeppelin firm, was responsible for the well-known Zeppelin-Staaken four-engined monoplane.

An associated company, known as the "Rohrbach-Metal-Aeroplan Co. A/S.," has been formed in Copenhagen, Denmark.

Machines designed by Dr. Rohrbach and produced by the Zeppelin firm, were fully described in previous volumes.

The first new machine designed and built by the new firm has been completed at Copenhagen, and reference should be made to Denmark for information.

RUMPLER.

Rumpler-Werke A.G.i.L.

The first aeroplane works in Germany, founded by the former engineer of the Daimler Motoren Gesellschaft, E. Rumpler. Acquired the license for building the Etrich "Taube," on which Hirth attained his early successes.

During the War Rumpler aircraft of many types were employed in the German service. For particulars see 1919 and 1920 editions of this Annual.

The Rumpler Werke A.G. has been in liquidation since 1921.

Dr. Rohrbach, designer of the great Staaken monoplane, was in the service of the firm for a short period in 1921. Dipl. Ing. Blume was then engaged with the Rumpler Werke, but left at the end of 1922, and no aircraft have been produced since 1919.

S

SABLATNIG.

Sablatnig Flugzeug-Bau G.m.b.H., Bellevuestrasse 3, Berlin.

The Sablatnig Flugzeug Bau G.m.b.H. of Berlin, was founded by Dr. Sablatnig, who before the War had set up several passenger carrying records on a "Union Arrow" type biplane, in October, 1915.

Several seaplane types for patrolling, scouting and school work were built during the War, and their success lead, towards the end of the War, to the building of Sablatnig landgoing two-seater machines, chiefly of the N. class for night work.

The Sablatnig firm, since the Armistice, has been active in regard to the commercial monoplanes designed for civilian purposes, which was fully described in the past two volumes of this Annual.

THE SABLATNIG TYPE P.3.

A small two-seater metal monoplane of the sporting type with the 50 h.p. Siemens-Halske air-cooled engine was built in 1921 and used for experimental work during 1922-3. This machine was also described in the 1922 edition.

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SIEMENS-SCHUCKERT.

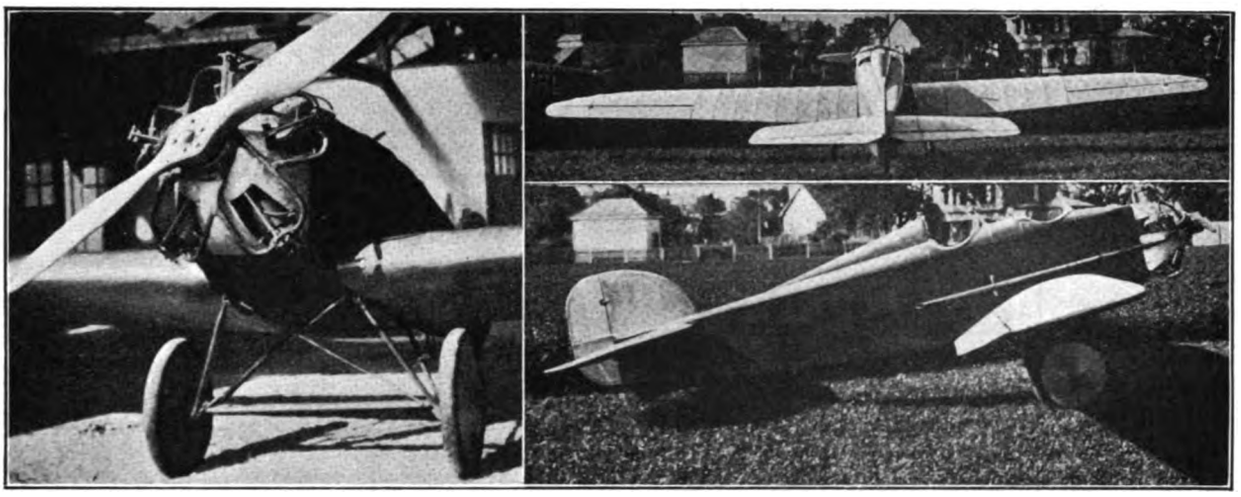
One of the many branches of the great Siemens electrical firm, which has world-wide ramifications.

The firm built an experimental airship some years before the war, and an experimental twin propeller single engine pusher in 1909/10.

During the war were mainly concerned with experimental Giant aircraft, but also produced at the end thereof some single-seat fighters. See 1920 edition for details of these.

No aircraft have been built since the war.

U



The Udet Two-seater Monoplane (55/60 h.p. Siemens engine).

UDET.

Udet Flugzeugbau G.m.b.H., München-Ramersdorf.

Brought out a small single-seater with a 30 h.p. engine, described in the last volume of this Annual.

The pre-war pilot, Dipl. Ing. E. Scheurmann, who during the war was managing director of the Bayerische Flugzeugwerke, Munich, is technical manager, whilst Herr Udet acts as test pilot and carries out the experimental work with new machines.

Designer Herrmann is at the head of the Experimental Office.

The firm built in 1923 a two-seater monoplane which flew from Munich to Hamburg (600 km. or 375 miles) in 5 hours 5 mins. en route for the Gothenburg Aero Show, where it was exhibited.

This machine is a low-wing cantilever monoplane with a 60 h.p. Siemens-Halske engine and tandem seats. The engine is fitted with a distinctly neat exhaust manifold and a long exhaust pipe.

THE UDET "LIMOUSINE."

A three-seater with an enclosed cabin for two passengers, which has been built for the Udet firm to the design of Herr Herrman.

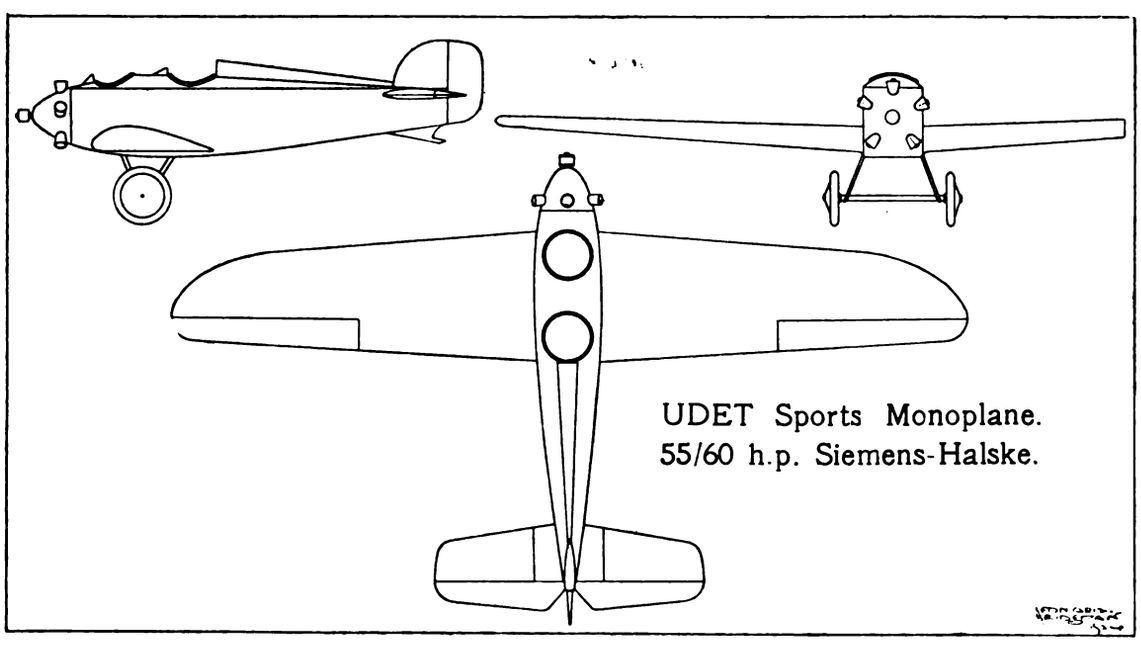
The outstanding features of this machine are the extremely clean fuselage form, the very high aspect ratio of the wing (8/1) and the provision of a properly-ventilated passenger cabin, a luggage compartment, and even an exhaust collector and a long exhaust pipe on a machine fitted with an air-cooled engine of only 70 h.p.

The fuselage is of oval section, built on formers and spruce longerons and covered with three-ply. The wing, which is built in one unit, is tapered in chord and camber and rounded at the tips. It is carried above the fuselage on four short struts, and may be removed by undoing four bolts coupling it to the struts.

The pilot's seat is below the leading edge, the passenger cabin is below the wings. The two seats are staggered somewhat, and the cabin is entered by a doorway of quite ample size. The pilot's cockpit is reached by way of the cabin. Behind the cabin is a luggage compartment.

The engine is mounted upon a bulkhead attached to the fore end of the fuselage and secured by four bolts.

The whole of the engine controls and instruments are carried from the rear face of this bulkhead, so that engine and its controls



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UDET—*continued.*

may be removed by taking off the bulkhead, the only join which needs to be broken being one in the petrol pipe line.

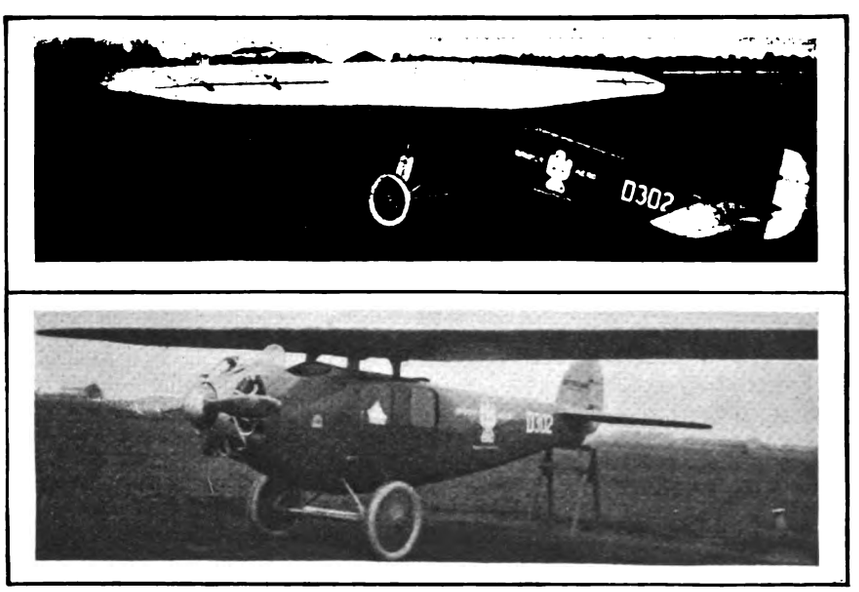
The undercarriage at present used is of fairly conventional form and is inferior in point of view of cleanness of design to the rest of the machine. It is, however, stated that an improved type is to be fitted to later models.

The engine exhaust pipe arrangement of this machine was described and illustrated in connection with the Gothenburg Exhibition. Briefly, an annular chamber which is made to serve as part of the nose-cowling of the engine receives exhaust pipes from each cylinder, and this collector discharges through a long pipe which runs back alongside the fuselage. A very satisfactory silencing effect is claimed—a somewhat important matter with a radial engine used for passenger-carrying.

If the claim that a speed of 180 km. (112 miles) p.h. is attained and if the performance in other respects is generally satisfactory, the machine should undoubtedly be of distinct commerical utility.

Specification.

Span	**12 m. (39 ft. 3 in.).**
Length	**7.8 m. (25 ft. 7 in.).**
Height	**2.45 m. (8 ft.).**
Wing area	**18 sq. m. (194 sq. ft.).**
Weight empty	**470 kgs. (1,034 lbs.).**
Weight loaded	**800 kgs. (1,760 lbs.).**
Engine	**Siemens-Halske, 70 h.p.**
Wing loading	**44.2 kgs./sq. m. (9.1 lbs./sq. ft.).**
Power loading	**11.4 kgs./h.p. (25 lbs./h.p.).**
Max. speed	**180 km.h. (112 m.p.h.).**



The Udet Limousine.

W

WELTENSEGLER.

Segelflugzeug Werke, G.m.b.H., Baden-Baden.
Manager : Herr A. Steinmetz. Designer : Herr Weuk.

Builders of the Weltensegler gliders and of low-powered types derived from gliders. Run a gliding school at the Wasserkuppe, in the Rhön mountains.

Z

ZEPPELIN.

The famous Zeppelin firm before the War took up the development of aeroplanes and seaplanes through the medium of the Flugzeugbau Friedrichshafen.

At its Lindau and Staaken works it devoted itself to the building of aeroplanes, particularly those of the "Giant" seaplane type designed by C. Dornier.

Though restrained by Versailles Treaty provisions from the immediate construction of further airships, the Zeppelin concern was by no means been aeronautically idle after the Armistice. The present condition of the associated firm is as follows :—

The airship works at Freidrichshafen (Luftschiffbau Zeppelin) are building an airship for the U.S.A. The Flugzeugbau Friedrichshafen works were diverted to the construction of motor-boats and the like, but are now in the hands of the Dornier Metallbauten G.m.b.H. (which see).

The Werft Warnemunde—a branch of the former F.F. works—has passed into the possession of an automobile company controlled by Stinnes, and is known as the Dinos-Werke.

A Seemoos factory was used, 1918 to 1922, as Dipl. Ing. Dornier's experimental establishment, and the Zeppelinwerk-Lindau was sold to a Swiss textile machine factory.

The Staaken works near Berlin, originally a branch airship works, during the War turned to giant aircraft production, and produced after the Armistice the well-known four-engined Staaken monoplane. Now they are closed, as the present conditions do not warrant the maintenance of two factories producing metal aircraft.

The Maybach Works and the Gear Works known as the Zahnradfabric Fredrichshafe, at Friedrichshafen, are under Zeppelin control. One airship shed is maintained at Friedrichshafen, Staaken and Loewenthal.

Dr. Rohrbach has left and has founded a separate concern.

The latest aeroplane products of the Zeppelin concerns were fully described in the previous volume. The activities of Dipl. Ing. Dornier and Dr. Rohrbach will be found recorded under their respective names.

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HOLLAND.

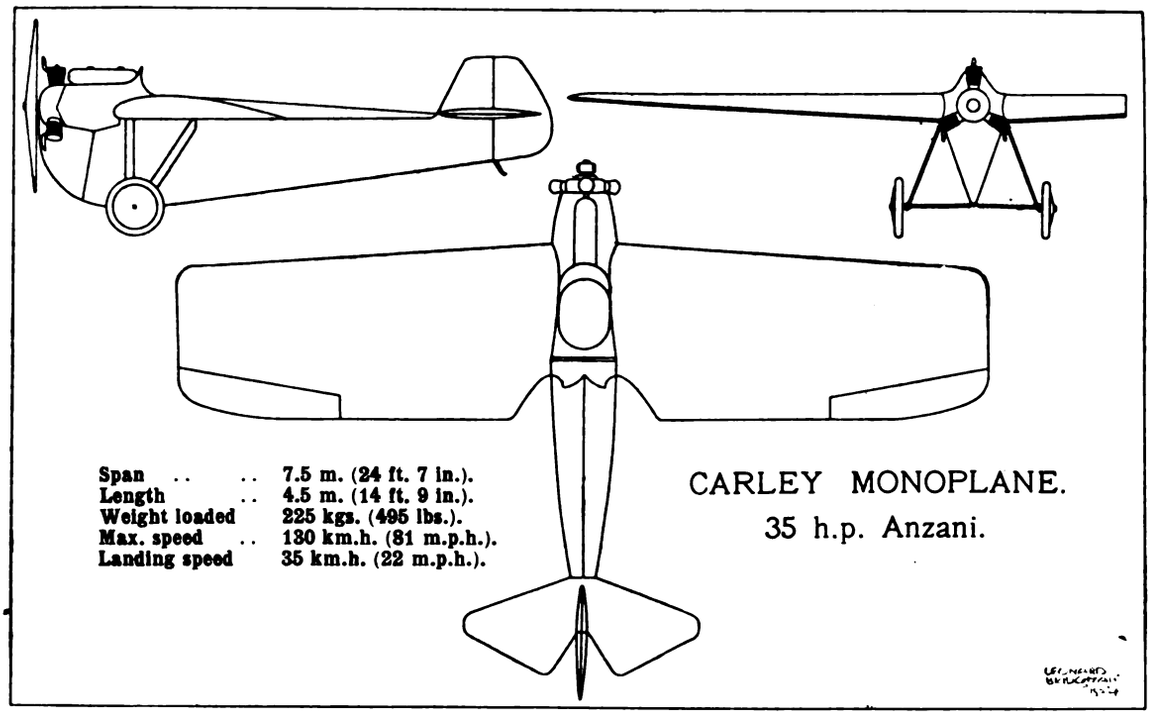
CARLEY.

Mr. Carley, at one time of Carley Aircraft Factory, later of the Nationale Vliegtuigindustrie, has again appeared as an independent constructor and produced a sporting single-seater monoplane. His address cannot be traced.

The machine is a cantilever monoplane with a very deep, nearly triangular, section fuselage. The pilot is seated between wing spars, and the engine is called a 25 h.p. Anzani. It appears to be the well-known 35 h.p. " Y " engine of this mark.

The machine is largely built of three-ply.

Mr. Carley has also built a two-seater training biplane, of which no details are yet available.



Span	**7.5 m. (24 ft. 7 in.).**
Length ..	**4.5 m. (14 ft. 9 in.).**
Weight loaded	**225 kgs. (495 lbs.).**
Max. speed ..	**130 km.h. (81 m.p.h.).**
Landing speed	**35 km.h. (22 m.p.h.).**

CARLEY MONOPLANE.
35 h.p. Anzani.

FOKKER.

The Dutch Aircraft Manufacturing Works, " Fokker " Ltd.
Main Office : Rokin 84, Amsterdam.
Works : Papaverweg, North of Y, Amsterdam.
Director : A. H. G. Fokker.

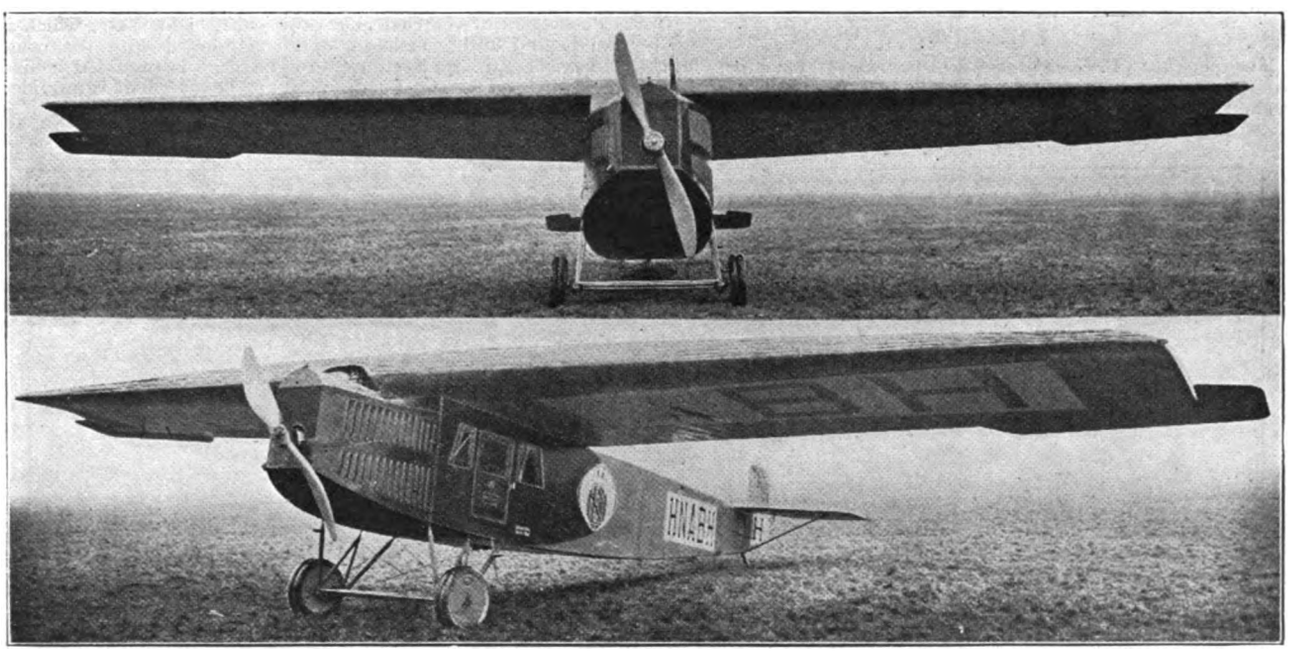
Builds Military Machines for Dutch Government and the well-known Passenger Monoplanes for the K.L.M. and other air lines.

The early productions of this firm—illustrated and described in previous editions of this work—proved remarkably satisfactory and the firm has continued the development of its various types of aircraft, as shown hereafter.

THE FOKKER F.III.

This machine is in regular service on the London-Amsterdam, the Hamburg-Bremen-Amsterdam-Rotterdam services of the K.L.M. company, and also on the service between Danzig and Memel.

The F.III is a single-engine monoplane with cantilever wing, built to carry five passengers, one pilot and five hours' fuel, a total load of 800 kgs. The power plant with tractor screw is in front, and the pilot's cockpit is at one side of the engine. The passengers' cabin is directly under and attached to the two main spars of the big wing. Behind the cabin the body tapers to a vertical knife-edge, to which the tail-plane, elevator and rudder are attached. With the exception of the wing, metal



Two views of the Fokker F.III Commercial Monoplane (Siddeley " Puma " engine). Note that balanced ailerons are fitted, although the drawing supplied by the makers does not show these. It will be noted that the engine is off-set to port.

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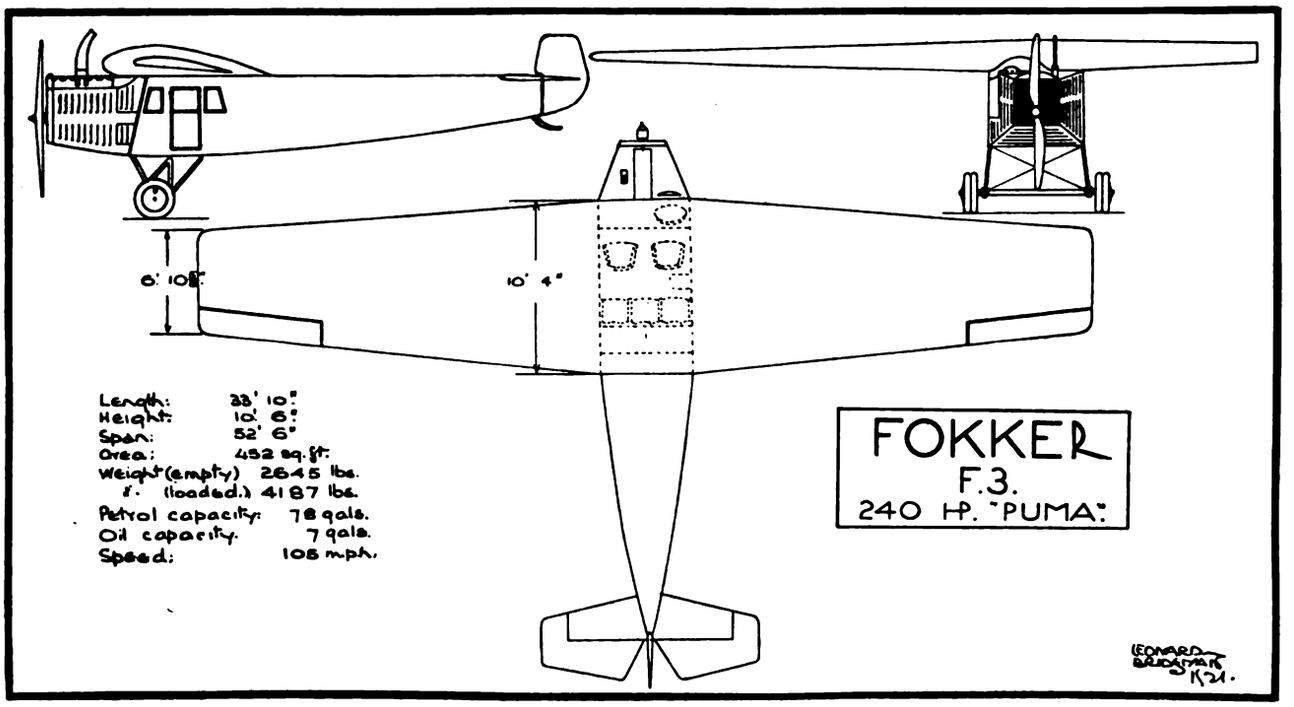
***FOKKER**—continued.*



construction has been employed throughout. The fuselage, the engine bearers, landing gear, ailerons and tail-plane are of welded steel tubing. The cowling consists of aluminium sheets, and the rear of the fuselage is covered with doped canvas.

Very great care has been taken to simplify removal of the engine cowling and uncovering of the power plant for inspection or repair takes place in a couple of minutes.

Flying Qualities.

The easy and smooth flexibility of the flying properties, which equal those of a small scout, are most astonishing in such a big machine as the F.III. Cruising speed is about 160 km. per hour. Another advantage is the fact that with a little practice the machine may be forced-landed in a comparatively small field. The performance of the machine is remarkable, considering the comparative small engine power.

The standard engine employed is the 230 h.p. Siddeley-Puma. This type of machine can be fitted however with any 6-cylinder engine of normal dimensions from 185-230 h.p. and weighing about 350 kgs.

A version of the F.III, fitted with a Rolls-Royce "Eagle," has been built, and is in use by the K.L.M air line and in Russia.

FOKKER FV.

The Fokker F.V is an eight-passenger machine, and can be either a monoplane or biplane at will. The pilot's cockpit, which has accommodation for two pilots, is immediately behind the engine, a Rolls Royce "Eagle VIII," of 360 h.p., and in rear of this is the passenger cabin, followed by a large toilet apartment, in which there is accommodation for two persons.

As already mentioned, this machine can be used either as a biplane, for heavy loads, or as a monoplane, for rapid transit with light loads. This alteration can be carried out in a few minutes by the removal of the bottom plane.

The fuselage is of the well-known Fokker steel tube construction, but the entire covering is three-ply instead of fabric, so that rigidity and strength has been greatly increased.

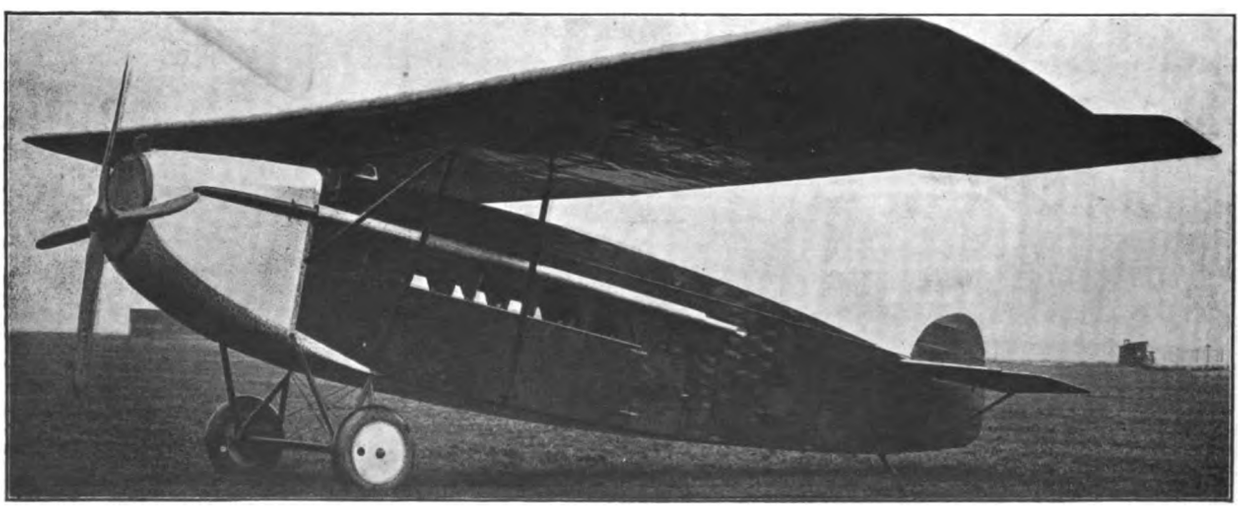
During the preliminary tests, eleven persons were carried with ease.

A full specification is given on the scale drawing.

THE FOKKER F.VII.

A commercial passenger carrier of similar type to the F.III, fitted with the Rolls-Royce "Eagle IX" engine and designed to carry six to eight passengers and two pilots. Fuel tanks of 600 litres (130 galls.), sufficient for six hours' flight, are fitted in the wing, and gravity feed alone is used.

Passengers are carried in a cabin with eight seats, which is well heated and ventilated, and is equipped with the usual conveniences. Ample stowage for baggage is provided behind the cabin, and a space for compact but heavy goods is provided below the pilot's seat.



The Fokker F.5 as a monoplane.

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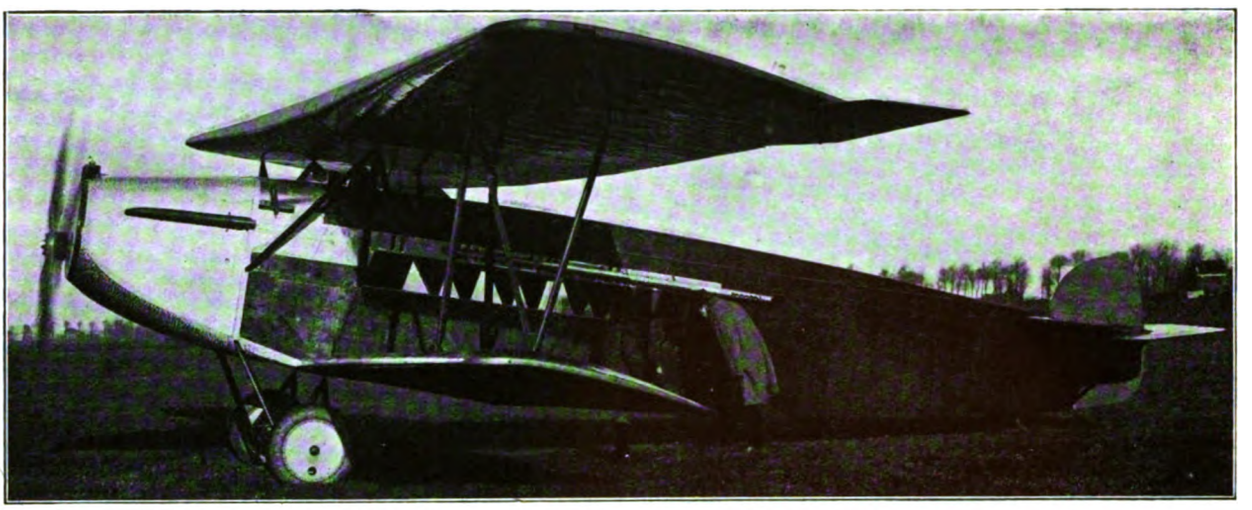
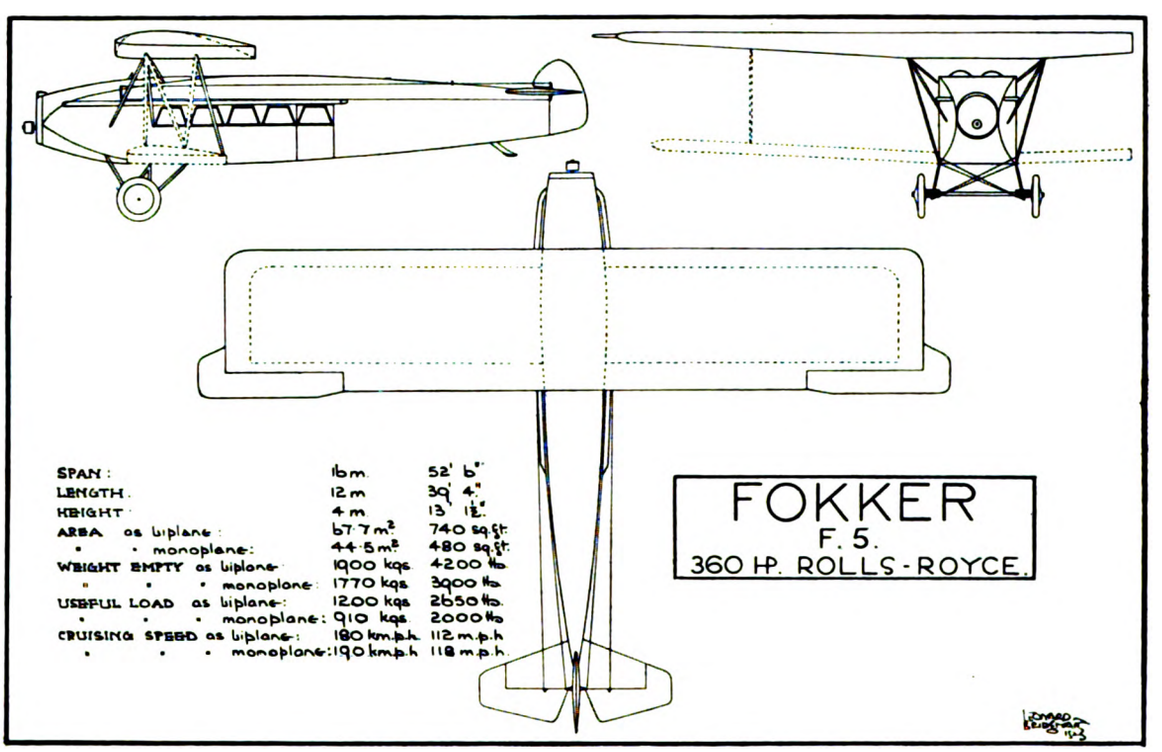
FOKKER—*continued.*



The Fokker F.5 (Rolls-Royce "Eagle") as a biplane.


FOKKER
F. 5.
360 HP. ROLLS-ROYCE.
SPAN: 16 m. 52' 6"
LENGTH: 12 m 39' 4"
HEIGHT: 4 m 13' 1½"
AREA as biplane: 67.7 m² 740 sq.ft.
" " monoplane: 44.5 m² 480 sq.ft.
WEIGHT EMPTY as biplane: 1900 kgs. 4200 lbs.
" " monoplane: 1770 kgs. 3900 lbs.
USEFUL LOAD as biplane: 1200 kgs. 2650 lbs.
" " monoplane: 910 kgs. 2000 lbs.
CRUISING SPEED as biplane: 180 km.p.h. 112 m.p.h.
" " monoplane: 190 km.p.h. 118 m.p.h.

The Fokker F.4 (400 h.p. Liberty) belonging to the U.S. Army.

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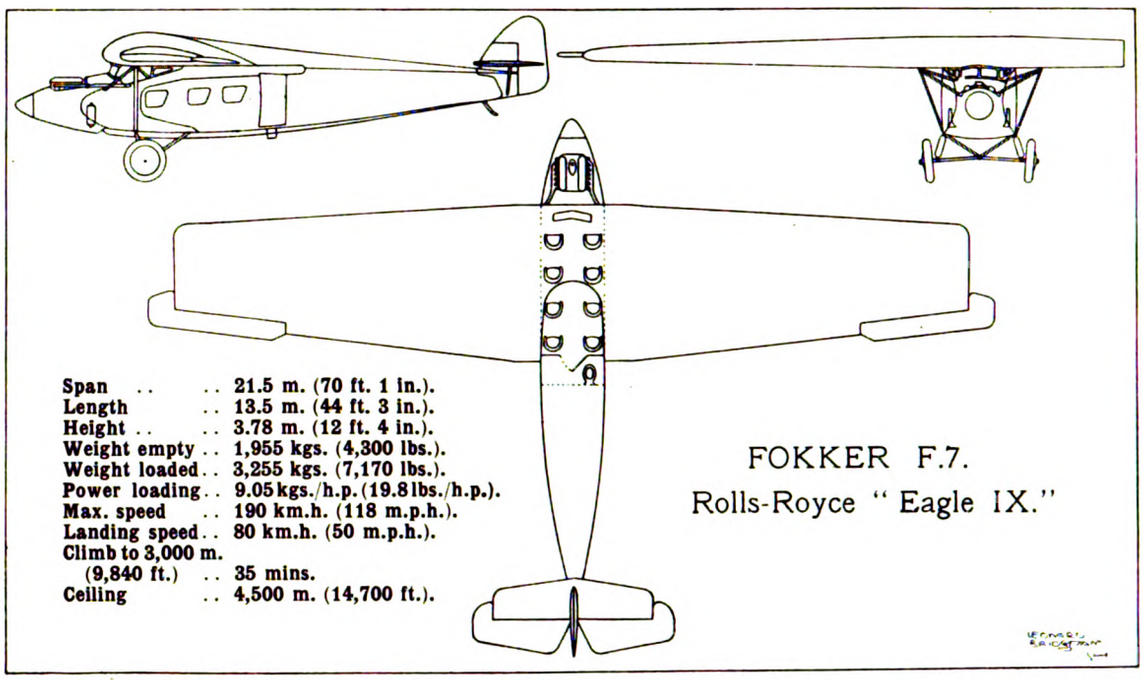
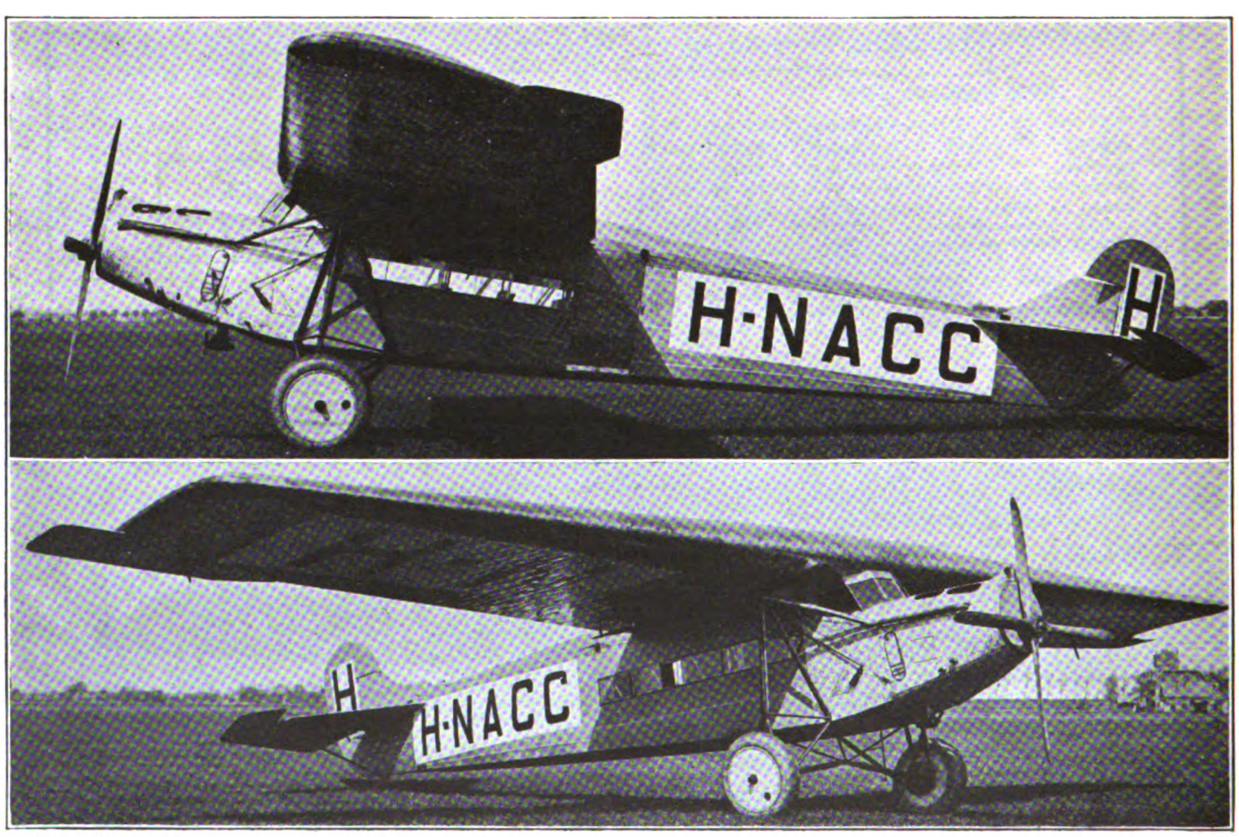
FOKKER—*continued.*



Span	21.5 m. (70 ft. 1 in.).
Length ..	13.5 m. (44 ft. 3 in.).
Height	3.78 m. (12 ft. 4 in.).
Weight empty ..	1,955 kgs. (4,300 lbs.).
Weight loaded ..	3,255 kgs. (7,170 lbs.).
Power loading ..	9.05 kgs./h.p. (19.8 lbs./h.p.).
Max. speed ..	190 km.h. (118 m.p.h.).
Landing speed ..	80 km.h. (50 m.p.h.).
Climb to 3,000 m. (9,840 ft.) ..	35 mins.
Ceiling ..	4,500 m. (14,700 ft.).

FOKKER F.7.
Rolls-Royce "Eagle IX."



The Fokker F.7.

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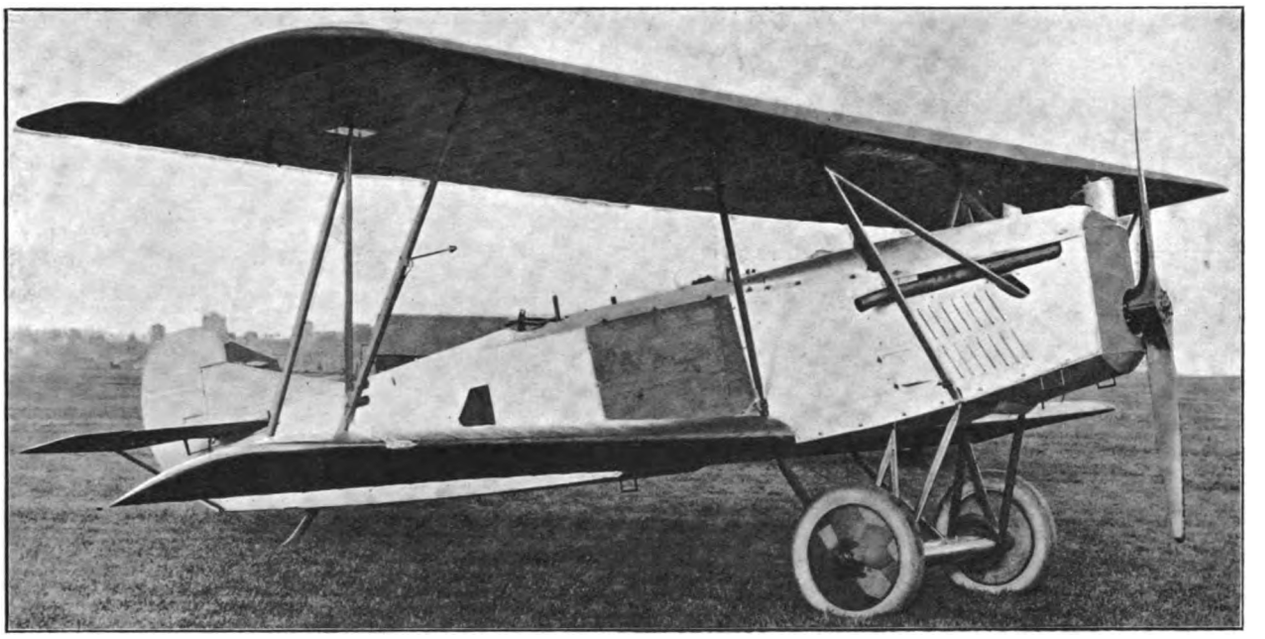
FOKKER—*continued.*



The Fokker C.IV (400 h.p. Liberty engine).

FOKKER C.IV.

The Fokker C.IV is a two-seater high performance reconnaissance fighter. In general appearance it is almost exactly like an enlarged D.VII.

The fuselage is welded steel tubes and is covered from the nose to the pilot's seat with sheet aluminium, from the pilot's seat to the observer's seat with three-ply or armour, if desired, and from there to the tail it is fabric covered.

The engine is a 400 h.p. Liberty, with a nose radiator. The cockpits are both very fully equipped, there being a double set of controls, and full equipment of instruments, camera, W/T. gear, fire extinguisher, etc. A Scarff ring gun mounting is fitted over the observer's cockpit.

The main planes are of usual Fokker construction, except that only the top centre section is wood covered, the rest of the plane covering being fabric. The planes are fairly heavily staggered.

Specification is given on the attached scale drawing.

A modified version of the C.IV has been fitted with a Napier "Lion" engine, and has Lamblin radiators instead of a nose radiator.

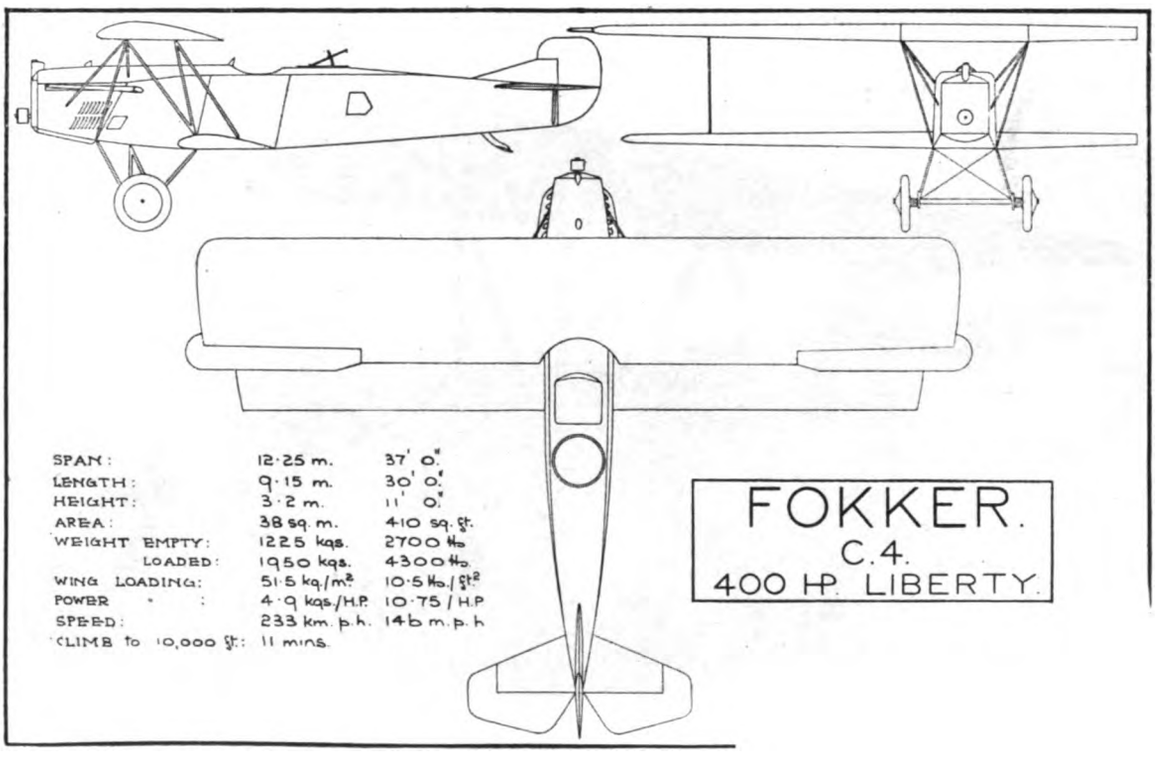
This machine has a top speed of 240 kms. (150 miles) per hour and climbs to 5,000 m. with 700 kgs. useful load in 16 mins.

THE FOKKER D.C.1.

A two-seater fighter reconnaissance machine on the lines of the C.IV, but with the Napier "Lion" engine. The machine is more specifically intended for attack on hostile formations, and to secure the maximum performance the fuel capacity is reduced and slightly less wing area is used than in the C.IV. Two synchronized guns firing forward, a Scarff ring aft, and also a special gun mounting firing down through the floor, form the armament.

Specification.

Span	**11.45 m. (37 ft. 7 in.).**
Length	**9.1 m. (29 ft. 10 in.).**
Height	**3.4 m. (11 ft. 2 in.).**
Wing area	**34.2 sq. m. (367 sq. ft.).**
Weight empty	**1,270 kgs. (2,794 lbs.).**
Weight loaded	**1,800 kgs. (3,960 lbs.).**
Wing loading	**52.6 kgs./sq. m. (10.8 lbs./sq. ft.).**


SPAN: 12·25 m. 37' 0"
LENGTH: 9·15 m. 30' 0"
HEIGHT: 3·2 m. 11' 0"
AREA: 38 sq. m. 410 sq. ft.
WEIGHT EMPTY: 1225 kgs. 2700 lbs
LOADED: 1950 kgs. 4300 lbs
WING LOADING: 51·5 kg/m² 10·5 lbs./ft²
POWER : 4·9 kgs./H.P. 10·75 / H.P
SPEED: 233 km. p.h. 146 m.p.h
CLIMB to 10,000 ft: 11 mins.
FOKKER.
C.4.
400 HP. LIBERTY.

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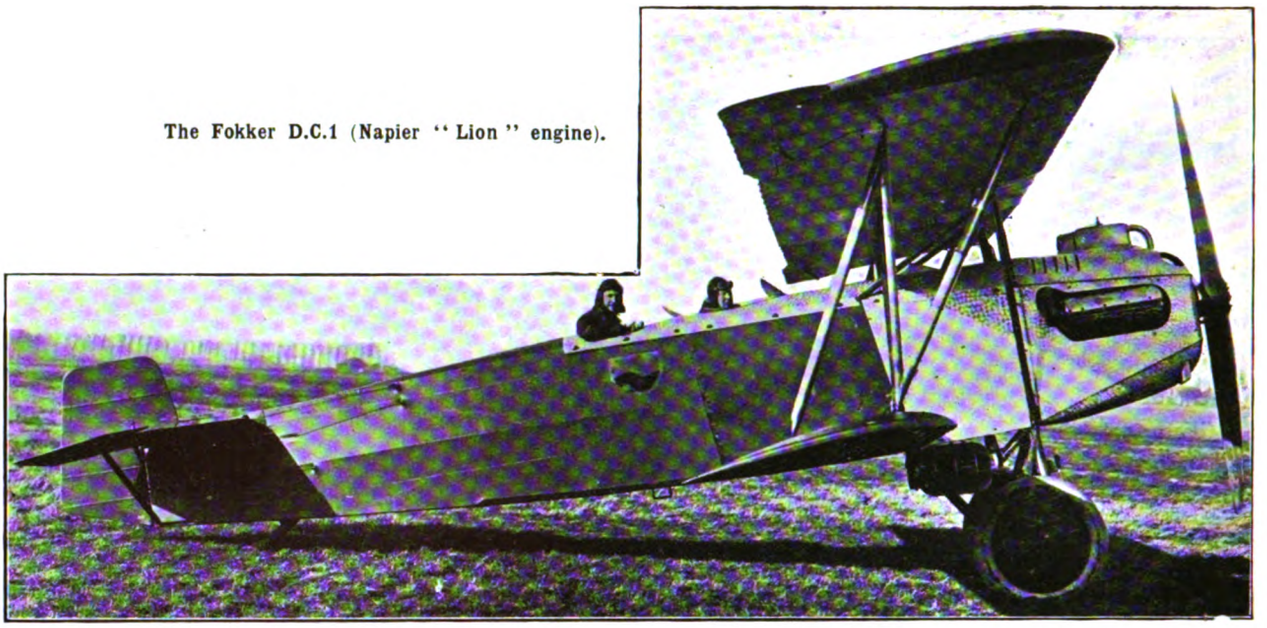
FOKKER—*continued.*

The Fokker D.C.1 (Napier "Lion" engine).



Power loading	**4 kgs./h.p. (8.8 lbs./h.p.).**
Max. speed	**245 km.h. (152 m.p.h.).**
Climb to 5,000 m. (16,400 ft.)	**13 mins.**
Ceiling	**8,000 m. (26,000 ft.).**

FOKKER D.XI.

The Fokker D.XI is a single-seater fighter biplane with strut braced heavily staggered wings. It is fitted with either the 300 h.p. Hispano-Suiza engine or the 375 h.p. Curtiss D.12. The fuselage and engine bearers are of steel tubes. The cooling is by side radiators, which can be drawn into the fuselage to vary the cooling. The main petrol tank, of 250 litres capacity, is carried in the fuselage, with a gravity tank of 45 litres capacity is mounted on the top plane.

The top plane has one-piece spars of box section, of which the rear one is attached at two points to struts welded to the fuselage. The front spar is supported by two struts, which run to the top of the fuselage, and are braced by a single compression strut running from the top of these fuselage struts to the bottom end of the front interplane strut. The wings are fabric covered, the leading edge being reinforced with ply covering. Ailerons are fitted to the top plane only and, like the other control surfaces, are of steel tube construction. Great importance is attached to the ease of erection and dismantling, and all parts are so designed and constructed so that interchangeability is facilitated.

Specification.

Span	**11.4 m.**
Length	**7.8 m.**
Height	**2.8 m.**
Area	**26.5 m^2.**
Wing loading	**47 kgs./m^2.**
Power loading	**4.15 kgs./h.p.**
Weight empty	**865 kgs.**
Weight loaded	**1,250 kgs.**
Speed, max.	**255 km.p.h.**
Climb to 5,000 m.	**16.3 mins.**
Engine	**300 h.p. Hispano-Suiza.**

THE FOKKER AMPHIBIAN F.B.II.

This machine has recently been produced for the service of the Dutch Navy.

The hull is entirely constructed of duralumin, and is built up on a very stiff keel girder which extends throughout at practically the full depth of the hull. The form of the hull, with its two steps, very obviously follows British experience in design, and in fact very closely resembles the hull of the Vickers Vikings in lines.

The wings are of wooden construction, plywood covered, and are rigidly braced by a series of N struts, which form a "Warren" bracing. The upper wing is of greater span and

The Fokker D.XI (375 h.p. Curtiss D.XII engine).

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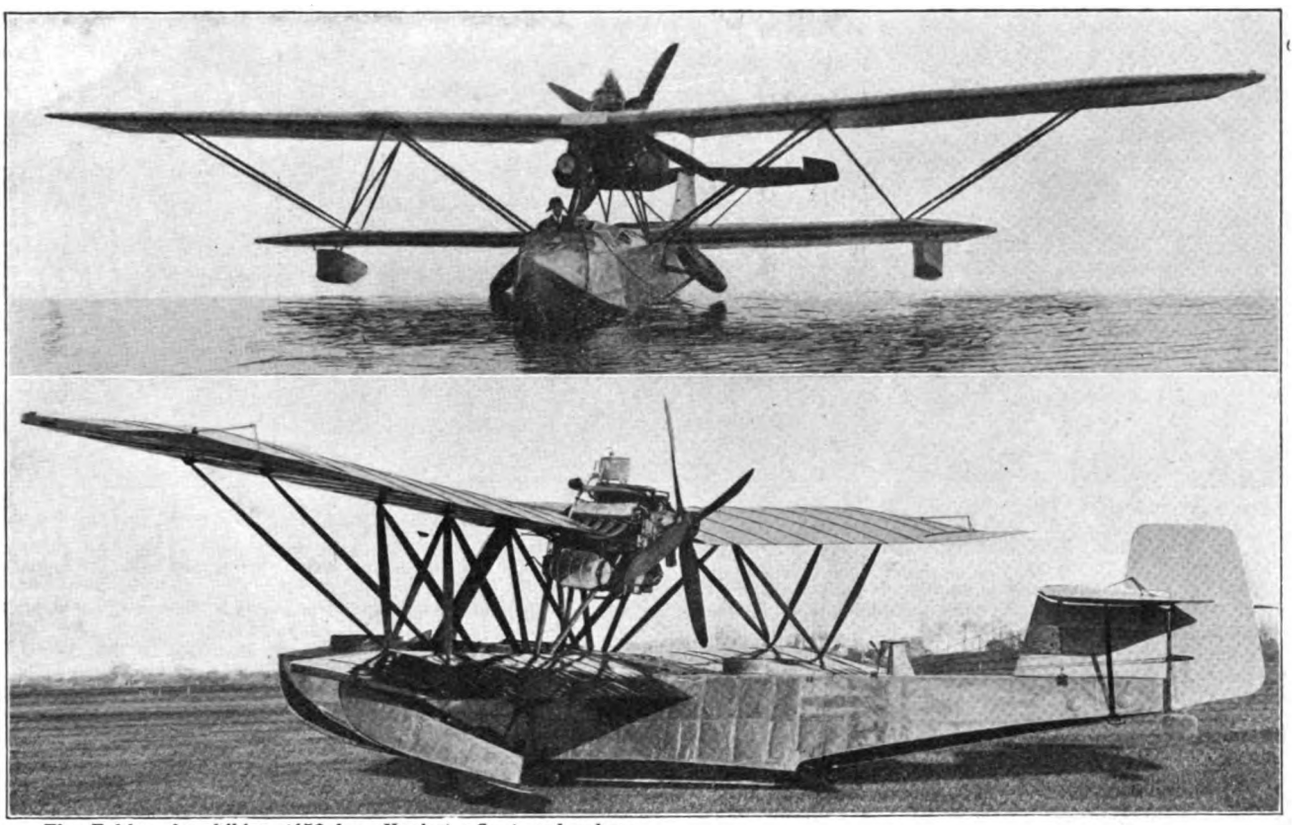
FOKKER—*continued.*



The Fokker Amphibian (450 h.p. Napier) afloat and ashore.

chord than the lower, it has a marked dihedral angle and a distinct backward rake from roots to the tips. The lower wing has neither dihedral nor backsweep, and is staggered back at the roots to such an extent that at the lower wing tips the trailing edges of the two wings are vertically one above the other. Ailerons are fitted to the upper wing only. The tail unit consists of a large tail plane carried well above the hull on a vertical fin, divided balanced elevators, and a large balanced rudder. The tail plane is hinged at its rear spar, and a tail incidence adjusting gear fitted inside the vertical fin allows for trimming the machine for varying loads and speeds.

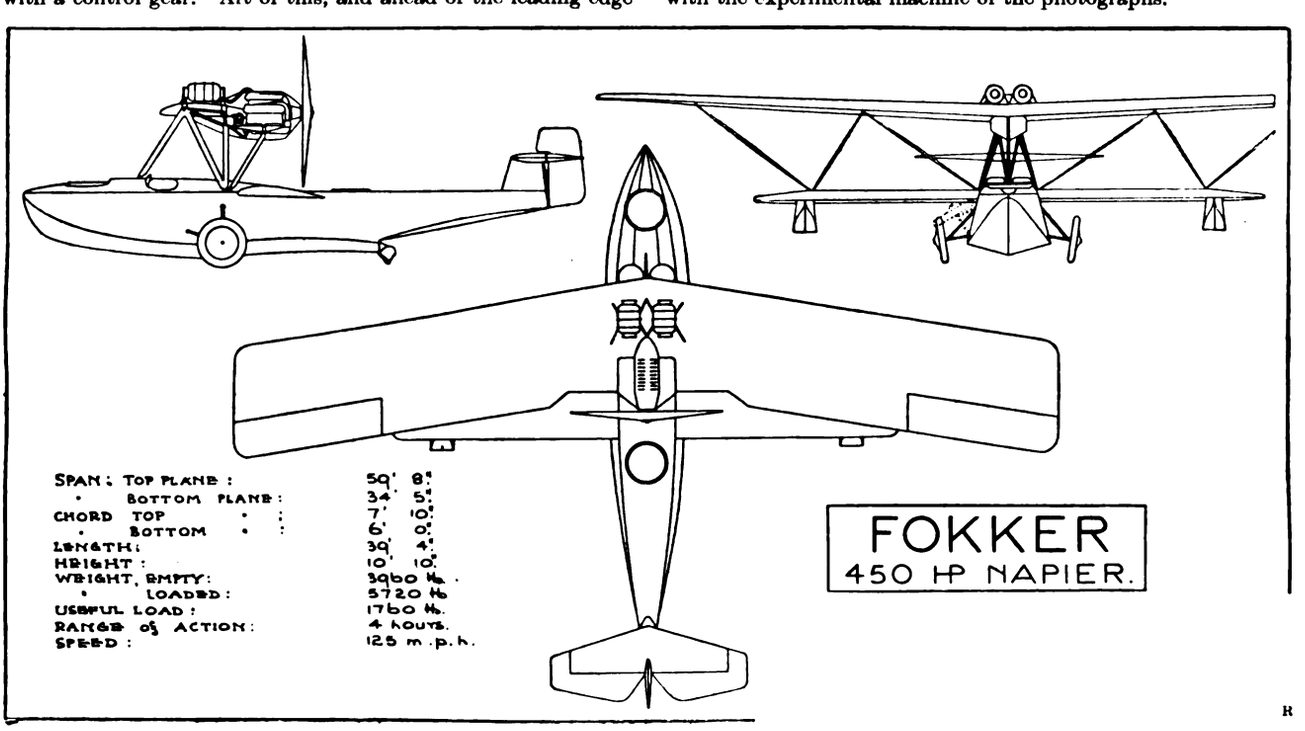
The engine—a Napier "Lion"—is carried by four special struts from the bottom wing root spars. The engine mounting proper forms a complete unit, to which are attached the Lamblin radiators, oil and water header tanks, and this unit, as a whole, may be detached by undoing four bolts, lifted out by a crane and stood on the four feet with which it is fitted.

The machine—as equipped for naval service—carries a gunner observer in the bows of the boat. This front seat is equipped with a control gear. Aft of this, and ahead of the leading edge of the wings, are two side-by-side seats—one for pilot and one for a mechanic. Behind the wings again is an after gunner's cockpit.

Four fuel tanks—of a total capacity of 600 litres (120 gallons)—are carried in the hull ahead of the after cockpit, with pump feed to a service tank in the top plane.

The wheeled undercarriage hinges about the end of an axle which passes into the hull, in such a manner that the wheels fold up below the lower wing—somewhat as in the case of the Supermarine amphibian built for the Air Ministry Competition of 1920.

The general appearance of the machine is well shown in the photographs reproduced, and the main dimensions, etc., are given on the outline general arrangement drawing. It should be noted that the drawing represents a machine which differs in some details from that shown by the photographs—notably in the arrangement of the radiators—and that it is not known whether the drawing represents the original design, which has been modified or whether it represents the result of experience with the experimental machine of the photographs.


SPAN: TOP PLANE : 50' 8"
BOTTOM PLANE : 34' 5"
CHORD TOP : 7' 10"
BOTTOM : 6' 0"
LENGTH: 39' 4"
HEIGHT : 10' 10"
WEIGHT, EMPTY: 3960 lbs.
LOADED: 5720 lbs.
USEFUL LOAD : 1760 lbs.
RANGE of ACTION: 4 hours.
SPEED : 125 m.p.h.
FOKKER
450 HP NAPIER.

R

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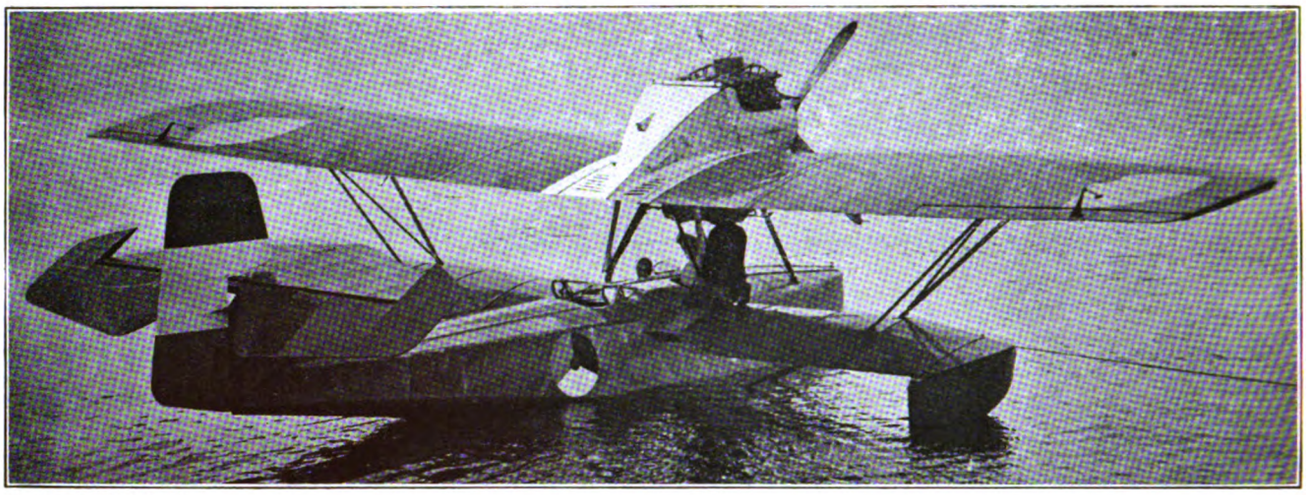


The Fokker B.II.

THE FOKKER B.II.

The F.B.II, as this type is known, is a two-seater tractor flying-boat, and is fitted with a 360 h.p. Rolls-Royce " Eagle IX " engine and Lamblin radiators.

In general arrangement of wings, hull and tail unit, the F.B.II resembles the Fokker amphibian flying-boat, but embodies some new features, the most notable of which are the reversion to wooden wings of the type made famous on all the landgoing Fokkers and a change from a two-step to a one-step hull. The hull is of duralumin construction, the single step being built onto the hull. Wooden rubbing strips along the keel from a point just in rear of the nose to the step, and along the fin chines are the only instances of the use of material other than metal in the hull.

The engine, a Rolls-Royce " Eagle IX," is carried on a steel tube erection over the hull, and is completely encowled with the exception of the cylinder heads and water pipes, these latter being led to a water header tank carried on top of the engine cowling. Two Lamblin radiators are mounted on the top plane over the rear spars up against the engine cowling.

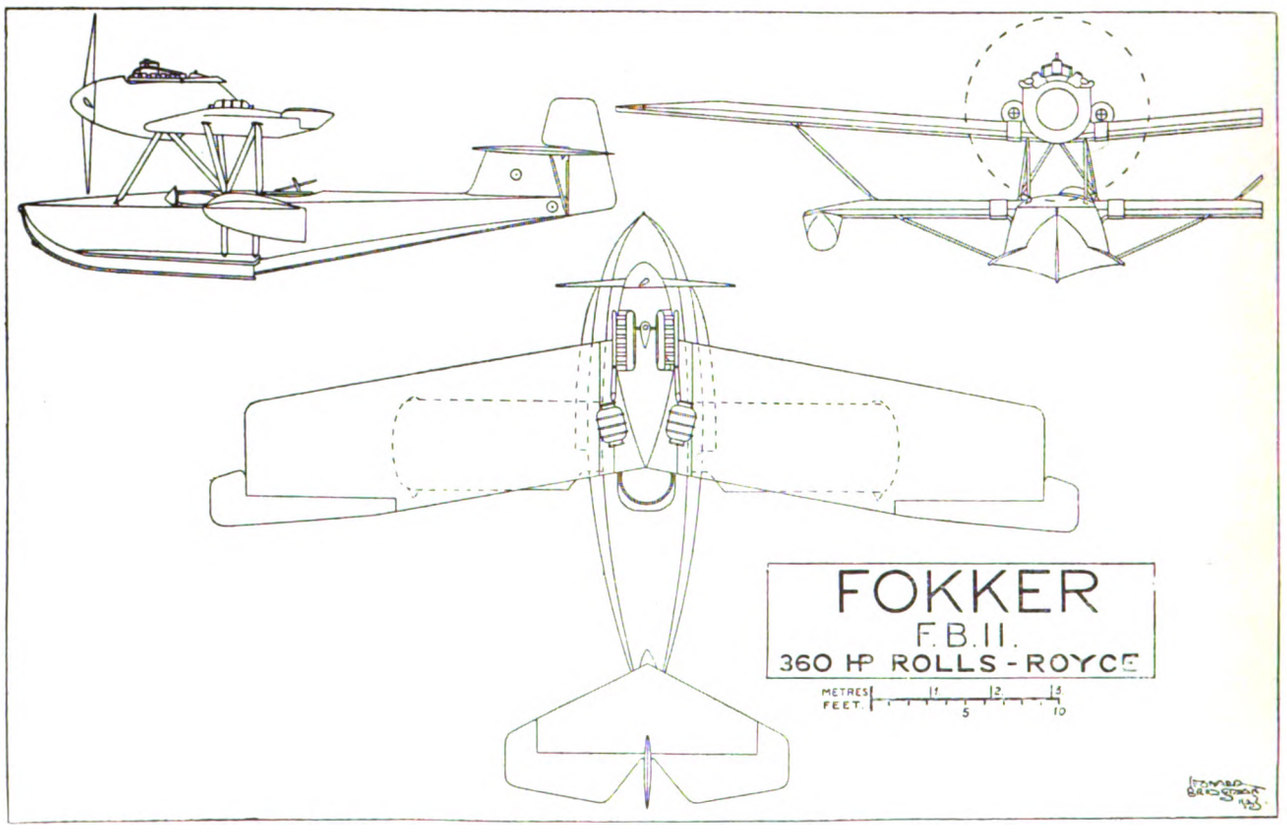
The wings are all-wood, a construction that has been found to be impervious to weather. The top planes are roughly twice the area of the bottom planes, and the former are swept back and set at a dihedral angle, whereas the bottom planes are flat and straight. The interplane struts are of N form heavily splayed, the bracing being carried through at a flatter angle to the boat-fin by two parallel struts. Owing to the sweep back of the top plane the struts from the side elevation are straight throughout.

The tail plane unit is practically identical to that fitted to the Fokker amphibian.

The pilot is situated on the left side of the hull, just in advance of the leading edge of the bottom plane, while the gunner-observer is situated in the rear of the main planes.

Specification.

Span	**14.6 m. (42 ft. 11 in.).**
Length	**9.85 m. (32 ft. 3 in.).**
Height	**3.80 m. (12 ft. 5 in.).**
Wing area	**40 sq. m. (430 sq. ft.).**
Weight empty	**1,300 kgs. (2,860 lbs.).**
Weight loaded	**2,100 kgs. (4,640 lbs.).**
Wing loading	**52.5 kgs./sq. m. (10.7 lbs./sq. ft.).**
Power loading	**5.85 kgs./h.p. (12.9 lbs./h.p.).**
Max. speed	**195 km.h. (121 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**6 mins.**
Ceiling	**4,000 m. (13,100 ft.).**



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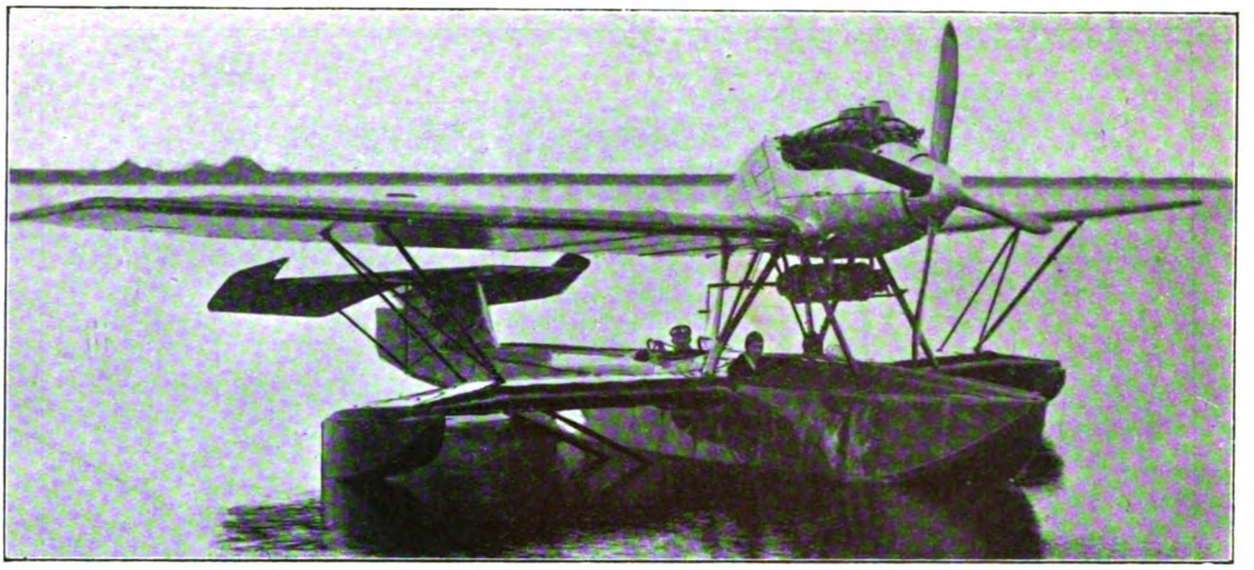


The Fokker F.B.2 (Rolls-Royce "Eagle IX" engine).

THE FOKKER T.III.

A large low-wing cantilever monoplane designed for torpedo carrying, to be fitted with either wheels or floats. To give clearance for the torpedo, a divided undercarriage is fitted, supported from the edge of the fuselage and from the wing spars on each side.

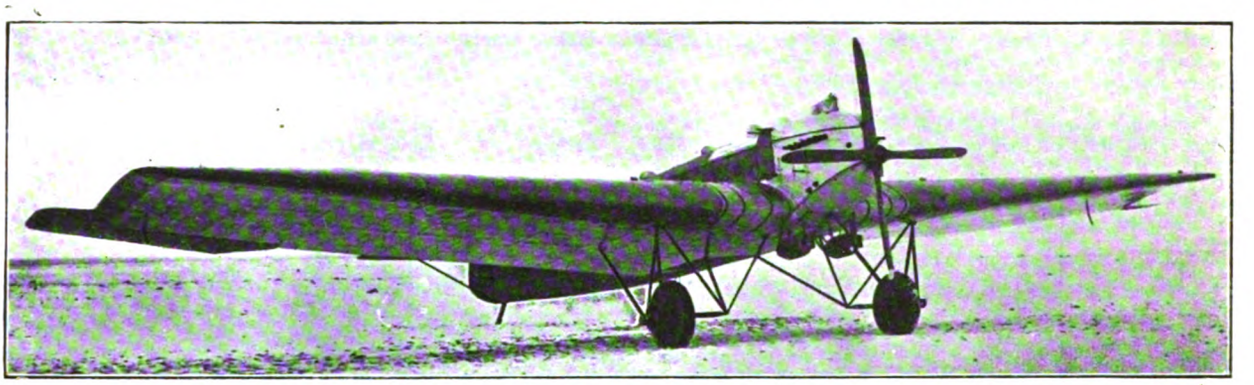
Two tandem seats—that of the pilot in front—are arranged just above the wing. The pilot's seat is well forward, and he has an excellent landing view.

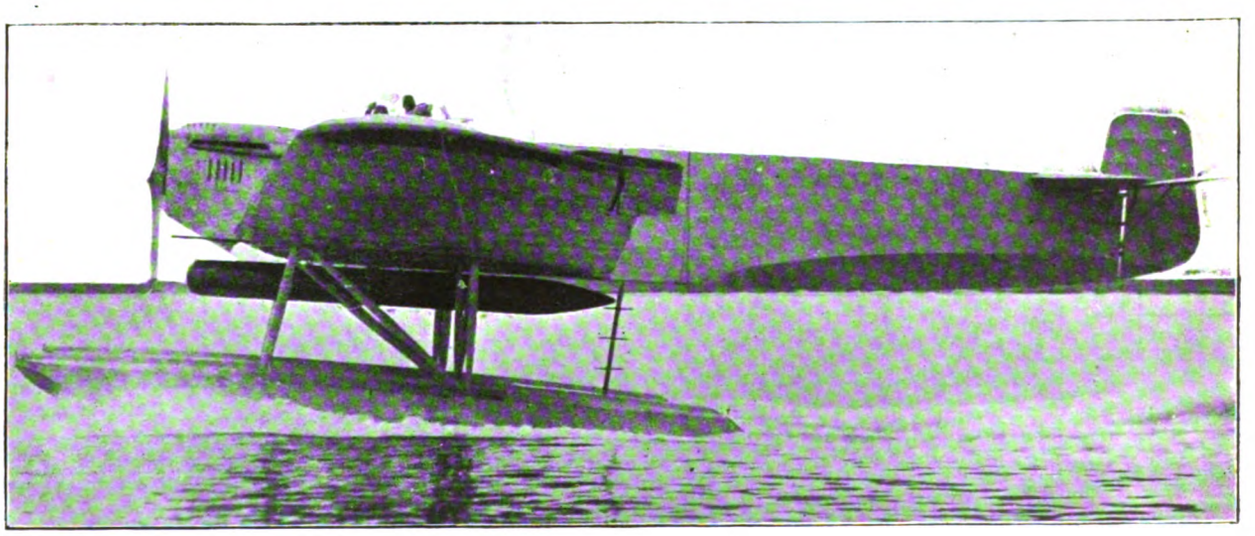
The engine is a 400 h.p. "Liberty," but the engine-mounting is a detachable structure, and other engines of similar output may be fitted as an alternative. Five machines of this type have been ordered by Capt. Saccadura Cabral for a forthcoming attempt to fly round the world.

Specification.

Span	**21.2 m. (69 ft. 6 in.).**
Length	**13.0 m. (42 ft. 8 in.).**
Wing area	**72.0 sq. m. (774 sq. ft.).**
Weight empty	**2,580 kgs. (5,676 lbs.).**
Weight loaded	**3,910 kgs. (8,602 lbs.).**
Wing loading	**56.5 kgs./sq. m. (11.1 lbs./sq. ft.).**
Power loading	**9.8 kgs./h.p. (21.5 lbs./h.p.).**
Max. speed	**167 km.h. (103 m.p.h.).**
Min. speed	**70 km.h. (44 m.p.h.).**
Climb to 3,000 m. (9,840 ft.)	**38 mins.**
Ceiling	**4,000 m. (13,100 ft.).**

Note.—The performances given are those with seaplane floats.





The Fokker T.III as Land Machine and Seaplane.

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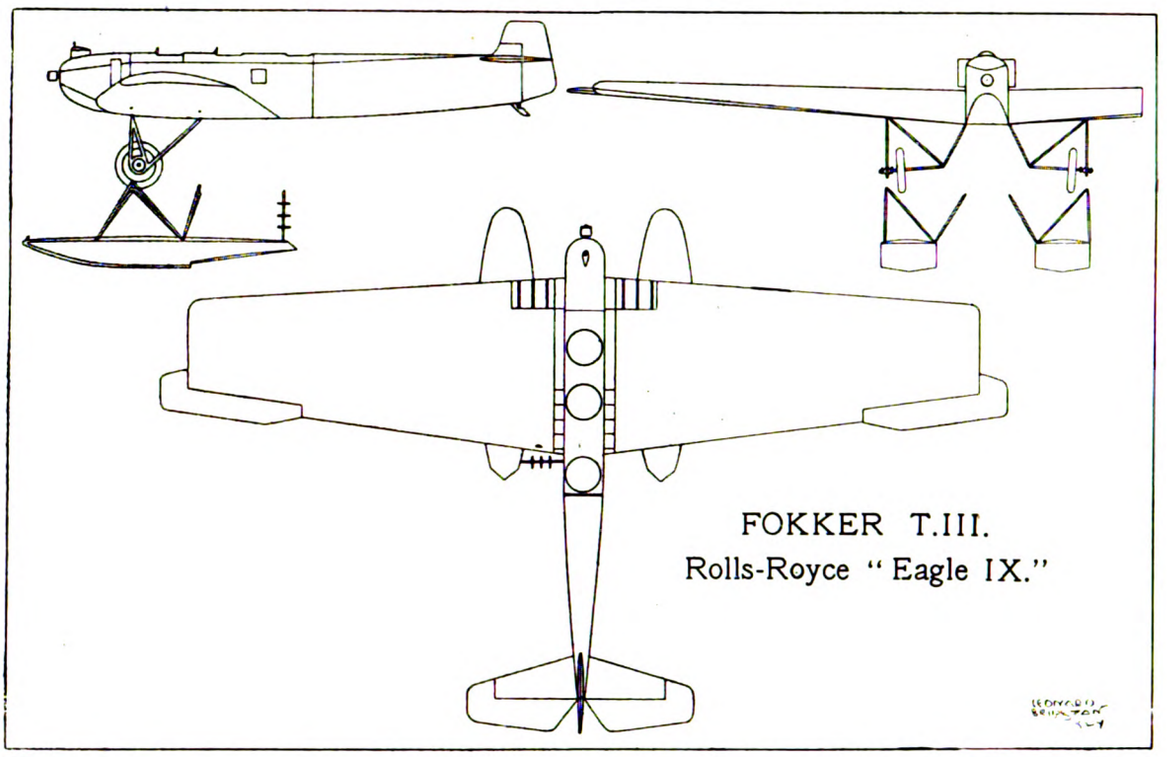
FOKKER—*continued.*



THE FOKKER 2T.IV.

A large low-wing cantilever monoplane somewhat similar to the T.III, but with twin engines mounted on the wings over the undercarriages. The machine is designed for bombing. Carries pilot in the nose of the fuselage and two gunners, with a formidable array of machine guns.

Each engine, with its radiators, etc., forms a unit and can be removed as such after undoing the holding-down bolts. Fuel tanks are built into the wings alongside the engines. Bombs are carried inside the fuselage, and they and their carrying gear are accessible to the crew in flight.

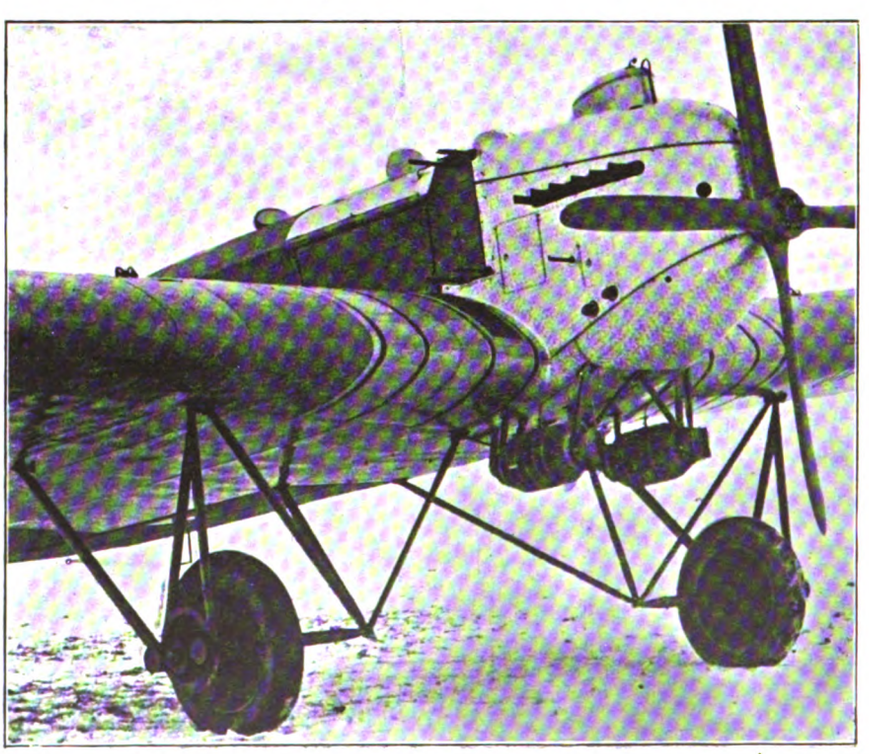
Either Rolls-Royce "Eagle IX" or "Liberty" engines may be fitted.

The machine carries 1,100 kgs. (2,420 lbs.) of bombs and 300 kgs. (660 lbs.) of fuel (about 2 hours). Without bombs, fuel up to 1,400 kgs. (3,080 lbs.), sufficient for eight hours' flight, may be carried.

The machine can be supplied either with wheels or with twin floats.

Specification.

Span		**20 m. (66 ft.).**
Length		**13.7 m. (45 ft.).**
	Land Machine.	**Seaplane.**
Weight empty	**3,200 kgs. (7,040 lbs.).**	**3,500 kgs. (7,700 lbs.).**
Weight loaded	**4,800 kgs. (10,560 lbs.).**	**5,100 kgs. (11,220 lbs.).**
Max. speed	**185 km.h. (115 m.p.h.).**	**175 km.h. (108 m.p.h.).**
Climb to 3,000m. (9,840 ft.)	**20 mins.**	**25 mins.**
Ceiling	**5,500 m. (18,000 ft.).**	**4,500 m. (14,700 ft.).**



Undercarriage, etc., of the Fokker T.III.

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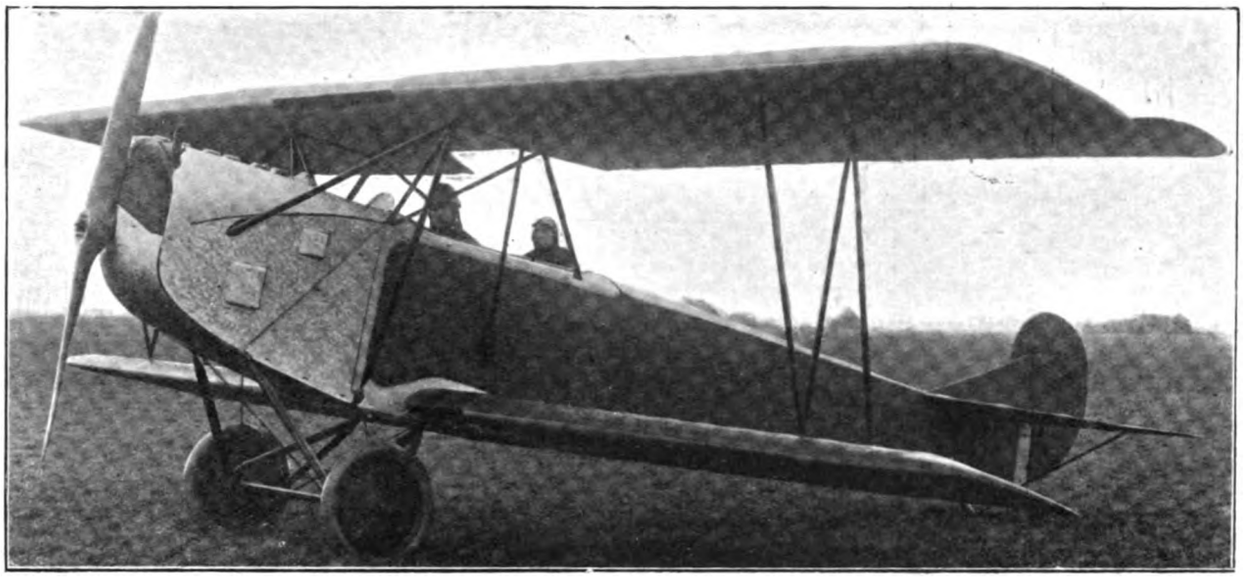
FOKKER—*continued.*



The Fokker S.III School Machine (120 h.p. Mercédès engine).

FOKKER F.W.II.

The Fokker F.W.II is a single-engined monoplane seaplane developed as a torpedo dropper. Barring the fact that it is equipped with a 400 h.p. Liberty engine, is of the usual Fokker construction, except that the plane is mounted at the base of the fuselage instead of above, and that one specimen has been acquired by the U.S. Naval Air Service, no detailed particulars are available.

FOKKER S.II TRAINING MACHINE.

The Fokker S.II is a two-seater side-by-side biplane resembling the type D.VII single-seater fighter in general form and construction. The fuselage, as in the case of all Fokker aircraft, is built up of welded steel tubes. The wings, which are cantilever, are of all-wood construction and are attached to the fuselage by a small number of bolts. The chief feature of the machine is the simplicity in the construction and the assembly. The machine can be fitted with any engine varying from 80-120 h.p., as, for instance, with the 80 h.p. Mercédès, the 80 h.p. Renault, the 90 h.p. Curtiss, the 100 h.p. Benz, the 110 h.p. Le Rhone, or the 110 h.p. Oberursel. The installation of the rotary engine is constructed in such a way that the entire power plant can be taken out by undoing four bolts. A gravity tank is mounted in the fuselage and an additional tank carried in the top plane can be used for flights of longer duration than is usual for instruction.

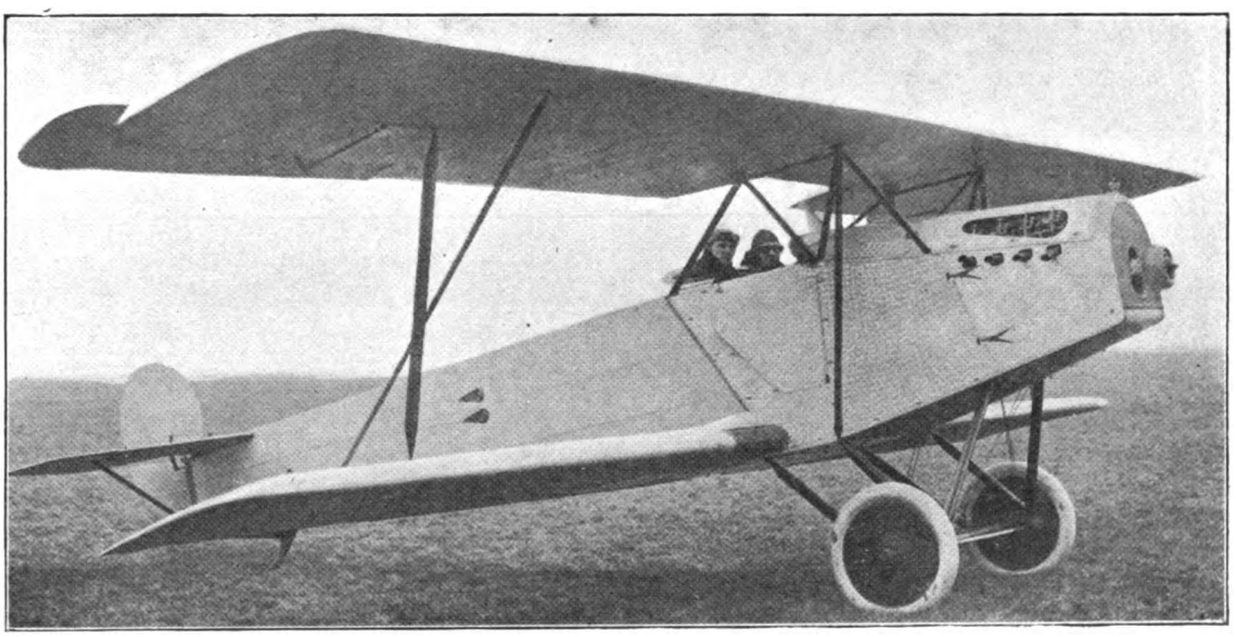
In a more recent version, known as the S.IIc, a 90 h.p. Curtiss engine has been used and the interplane struts have been changed from the "N" form to an "X" form, otherwise the machine retains all the feautres of the S.II.

Specification of the Fokker S.II.

Span	**11.16 m.**
Length	**7.175 m.**
Height	**2.8 m.**
Chord, top plane	**1.6 m.**
Chord, bottom plane	**1.2 m.**
Petrol capacity	**160 litres.**
Oil capacity	**30 litres.**
Speed (110 h.p. Le Rhone)	**150 km.p.h.**

THE FOKKER S.III.

Another training machine similar to the S.II, but with tandem instead of side-by-side seating. Both S.II and S.III can be supplied with a variety of engines, including 80 h.p. Renault, 80 h.p. and 110 h.p. Le Rhône, 90 h.p. Curtiss, 100 h.p. Bristol "Lucifer," 120 h.p. Mercédès, or 130 h.p. Clerget. Also, either machine may be fitted with floats for seaplane training.



The Fokker S.IIc (90 h.p. Curtiss engine).

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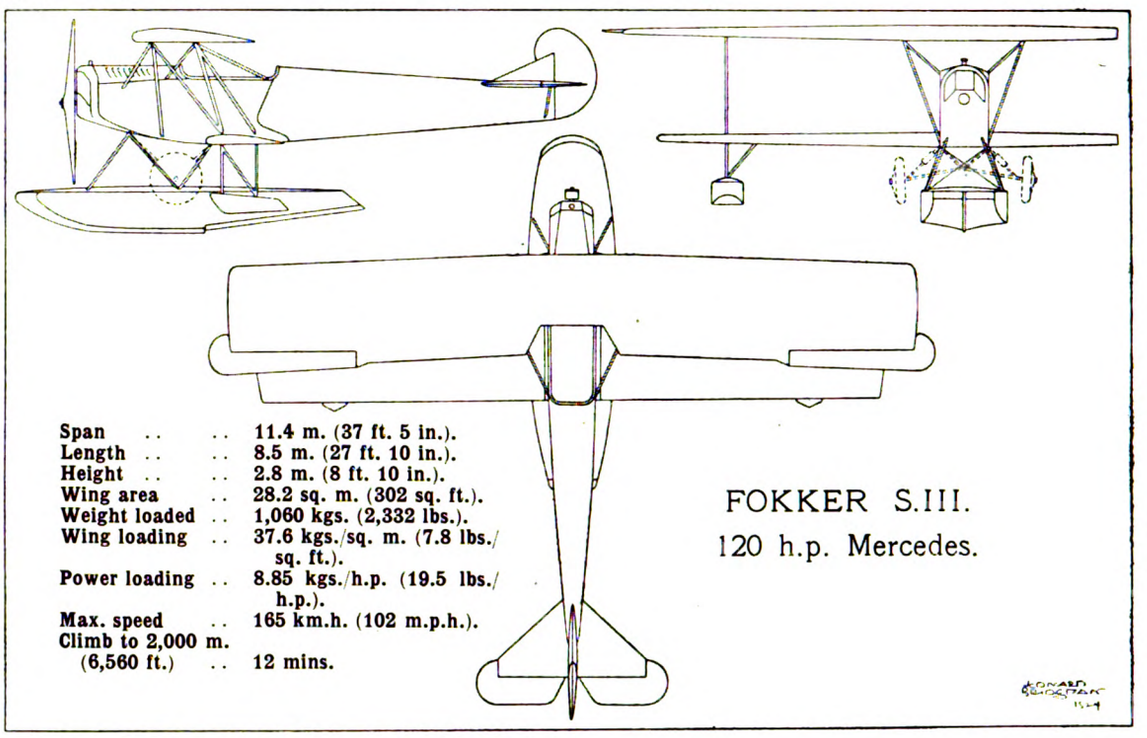
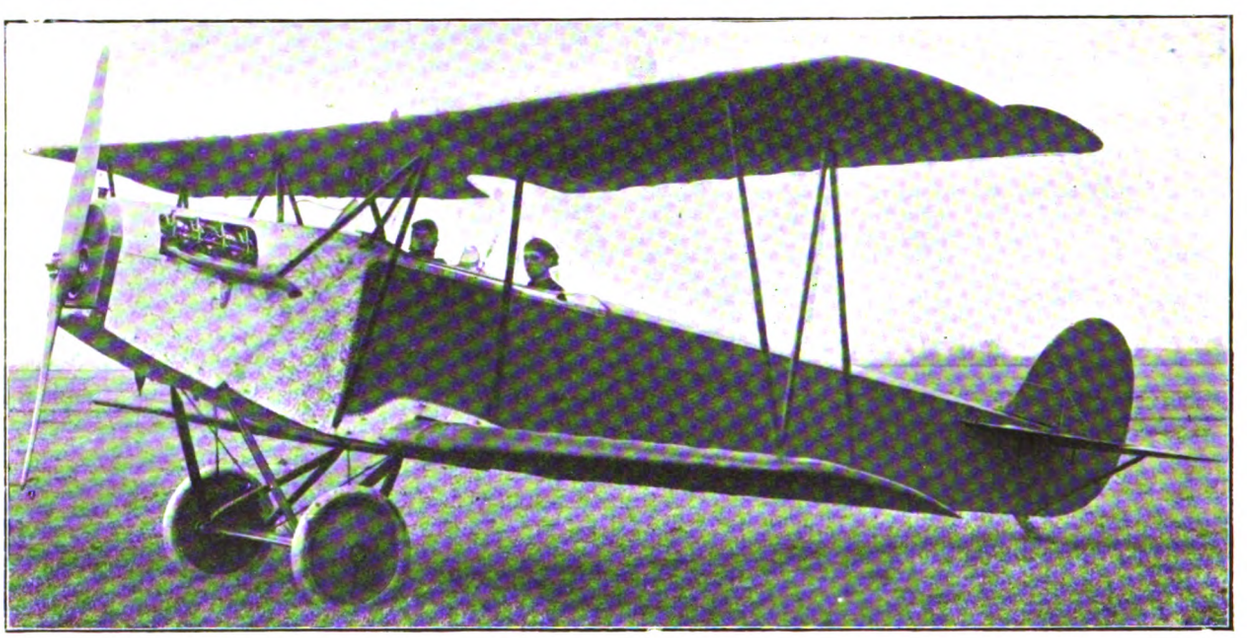
FOKKER—*continued.*

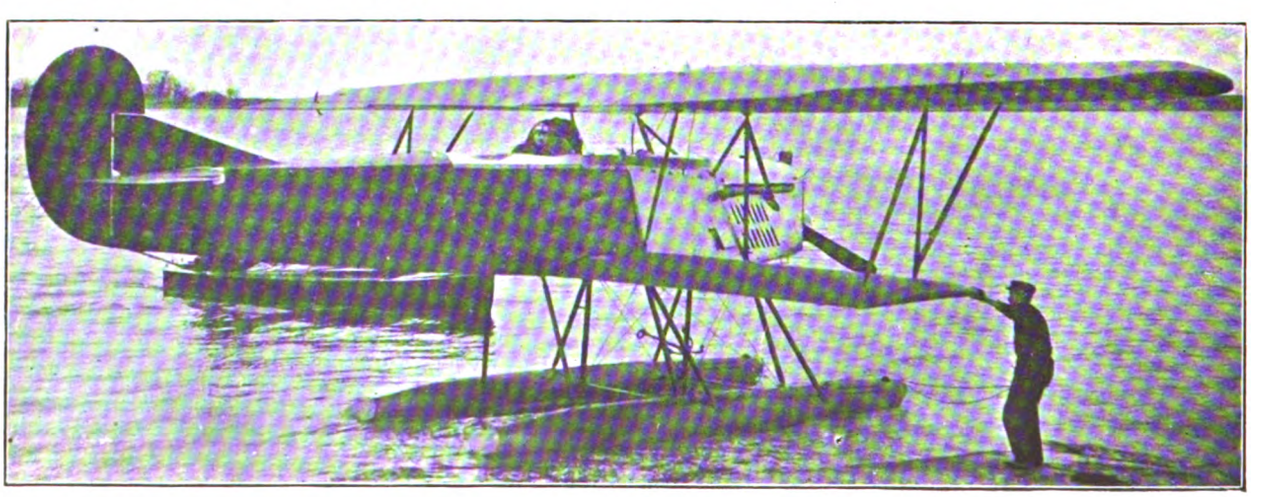


Span	.. ..	11.4 m. (37 ft. 5 in.).
Length	.. ..	8.5 m. (27 ft. 10 in.).
Height	.. ..	2.8 m. (8 ft. 10 in.).
Wing area	..	28.2 sq. m. (302 sq. ft.).
Weight loaded	..	1,060 kgs. (2,332 lbs.).
Wing loading	..	37.6 kgs./sq. m. (7.8 lbs./sq. ft.).
Power loading	..	8.85 kgs./h.p. (19.5 lbs./h.p.).
Max. speed	..	165 km.h. (102 m.p.h.).
Climb to 2,000 m. (6,560 ft.)	..	12 mins.

FOKKER S.III.
120 h.p. Mercedes.



The Fokker S.II (90 h.p. Curtiss engine).



The Fokker C.IV.W (400 h.p. "Liberty" engine).

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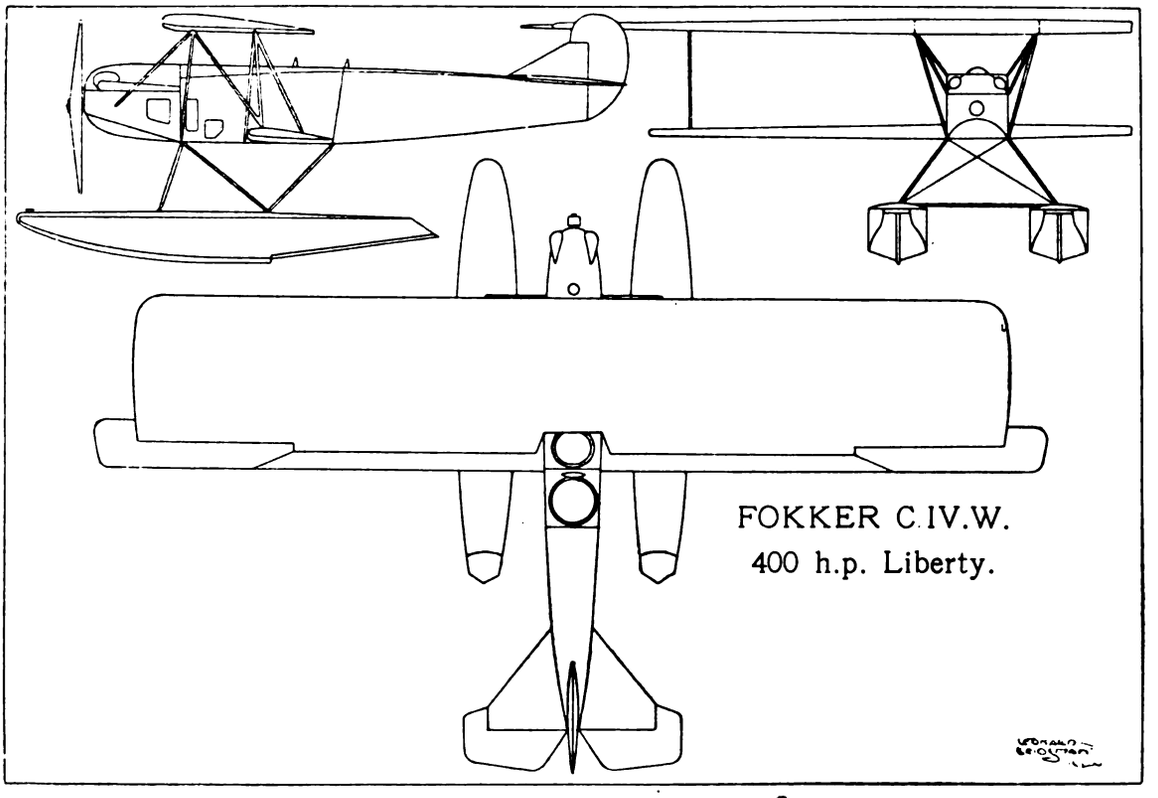
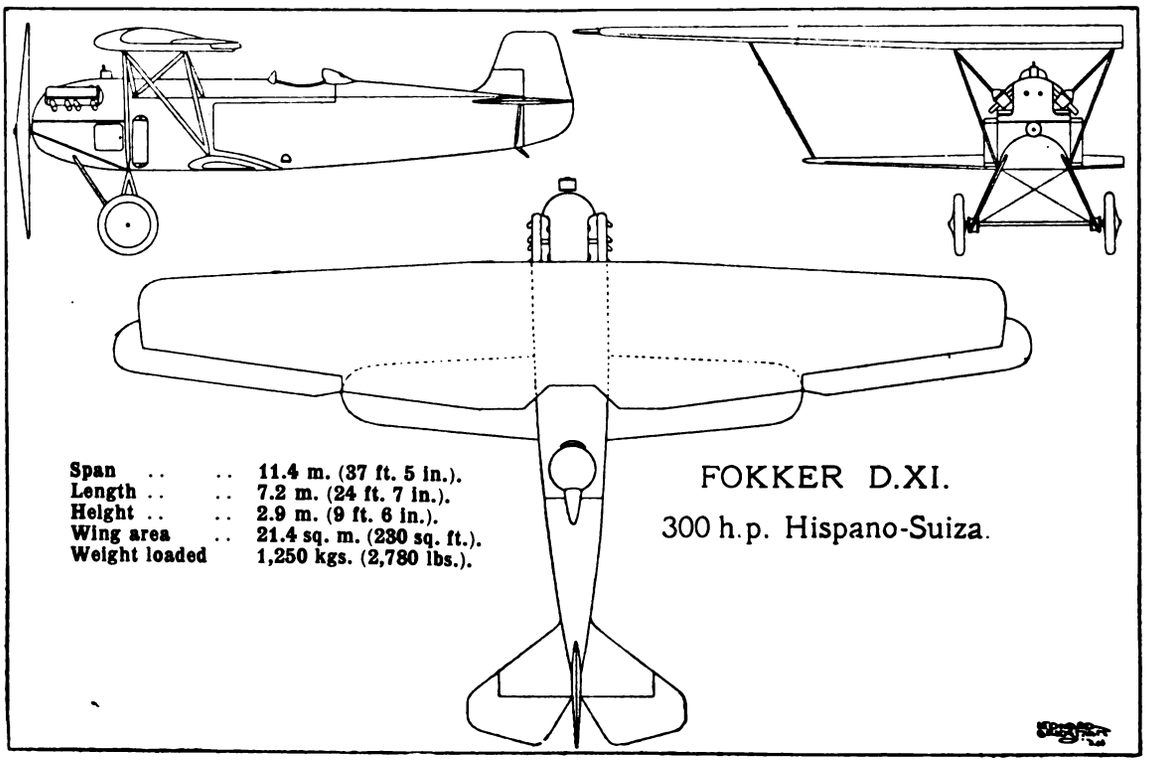
FOKKER—*continued.*



FOKKER C.IV.W.
400 h.p. Liberty.



Span	.. ..	11.4 m. (37 ft. 5 in.).
Length	.. ..	7.2 m. (24 ft. 7 in.).
Height	.. ..	2.9 m. (9 ft. 6 in.).
Wing area	..	21.4 sq. m. (230 sq. ft.).
Weight loaded		1,250 kgs. (2,780 lbs.).

FOKKER D.XI.
300 h.p. Hispano-Suiza.

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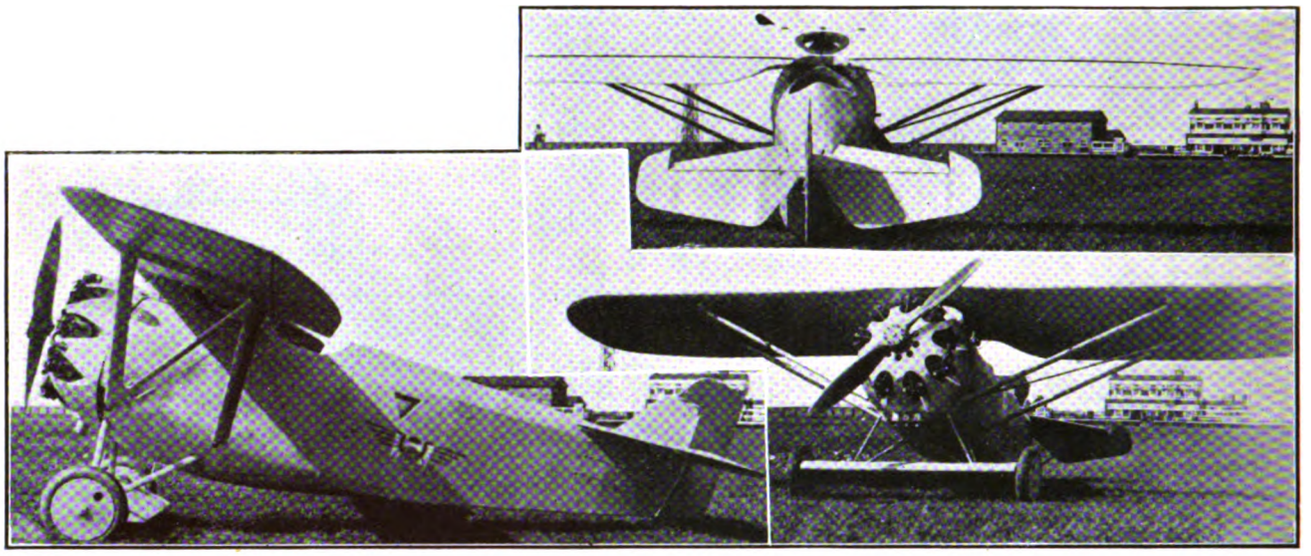
NATIONALE VLIEGTUIGINDUSTRIE.



The F.K.31 (400 h.p. Bristol "Jupiter" engine).

Nationale Vliegtuigindustrie, 's-Gravenhage.

This is a new firm which has secured the services of Mr. Frederick Koolhoven as designer. Colonel Wallaardt-Sacré, formerly commanding the Flying Corps of the Royal Dutch Army, is director.

THE TYPE F.K.31 TWO-SEATER FIGHTER.

The F.K.31 is a two-seater fighter, designed by Mr. Koolhoven. It is specially designed for long observation flights.

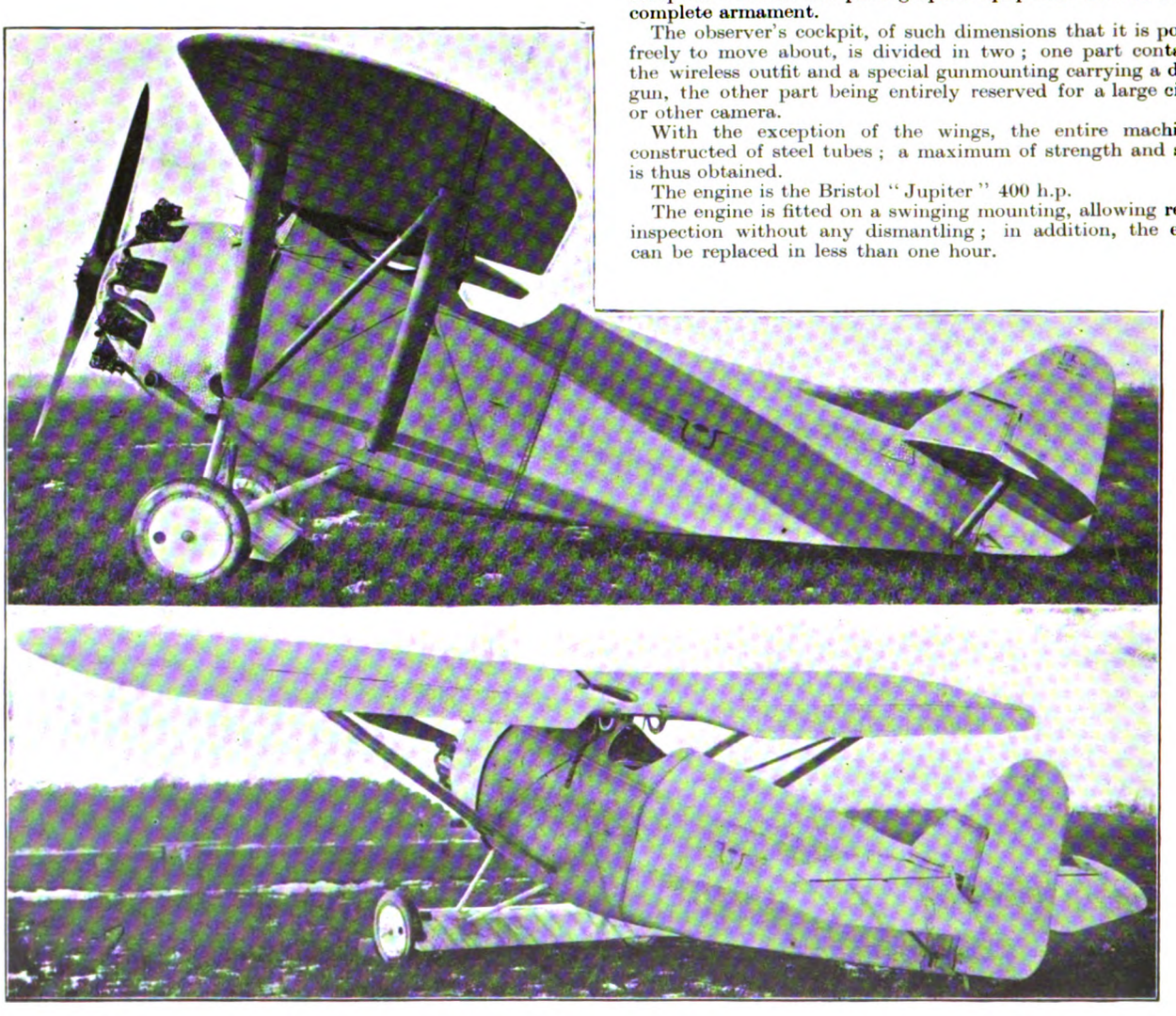
The design aims at the greatest possible reduction of weight, and more especially of size, in consequence of which a maximum of controllability is obtained. The machine is fitted with complete wireless and photographic equipment as well as with complete armament.

The observer's cockpit, of such dimensions that it is possible freely to move about, is divided in two; one part containing the wireless outfit and a special gunmounting carrying a double gun, the other part being entirely reserved for a large cinema or other camera.

With the exception of the wings, the entire machine is constructed of steel tubes; a maximum of strength and safety is thus obtained.

The engine is the Bristol "Jupiter" 400 h.p.

The engine is fitted on a swinging mounting, allowing regular inspection without any dismantling; in addition, the engine can be replaced in less than one hour.



The F.K.31 Two-seater Fighter.

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NATIONALE VLEIGTUIGINDUSTRIE—*continued.*

The F.K.31 in the air.

The undercarriage is fitted with a special type of non-recoil gear and is 12 ft. wide, thereby eliminating crashes in 80% of bad landings. The axles are separate and can be replaced without dismantling the shock absorbing gear. The tail skid is steerable.

All petrol is carried outside the fuselage. The petrol feed is effected by gravity. Tanks can be changed in 20 minutes.

Wings can be changed in 15 minutes.

Back of fuselage and tail unit are one, and can be detached for easy transport.

All cowling covering the fuselage can be removed by undoing three wing nuts, allowing for easy inspection of guns and fuselage.

The general arrangement drawing gives a complete specification.

The F.K.31 is being produced with a modified undercarriage and is now fitted with trailing-edge flaps to the wings.

The new version is shown in the scale drawing reproduced below.

THE F.K.23A.

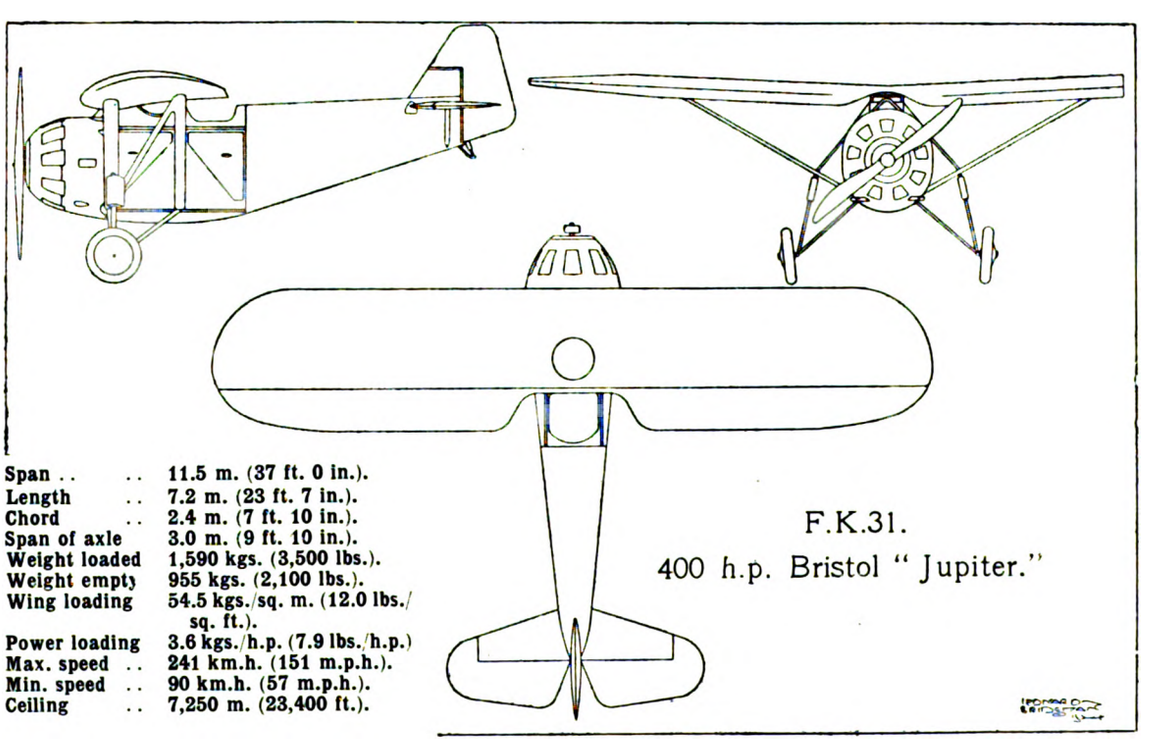
This machine is much like the well-known F.K.23, designed in 1917. The performance of this light single-seater fighter was such that Mr. Koolhoven has only changed a few minor points in view of his later experience.

The Siddeley "Lynx," the "Wright J.1" and a new engine now under construction much resembling the "Wasp II" engine, can be fitted.

Its construction has proved to be absolutely indeformable after years of hardship in all climates.

Its military equipment is more compact and practical than that of even much larger machines.

The remarkable low weight of 1,400 lbs. in combination with its great strength and rigidity, put it in a class by itself.



F.K.31.
400 h.p. Bristol "Jupiter."

Span	**11.5 m. (37 ft. 0 in.).**
Length ..	**7.2 m. (23 ft. 7 in.).**
Chord ..	**2.4 m. (7 ft. 10 in.).**
Span of axle	**3.0 m. (9 ft. 10 in.).**
Weight loaded	**1,590 kgs. (3,500 lbs.).**
Weight empty	**955 kgs. (2,100 lbs.).**
Wing loading	**54.5 kgs./sq. m. (12.0 lbs./sq. ft.).**
Power loading	**3.6 kgs./h.p. (7.9 lbs./h.p.)**
Max. speed ..	**241 km.h. (151 m.p.h.).**
Min. speed ..	**90 km.h. (57 m.p.h.).**
Ceiling ..	**7,250 m. (23,400 ft.).**

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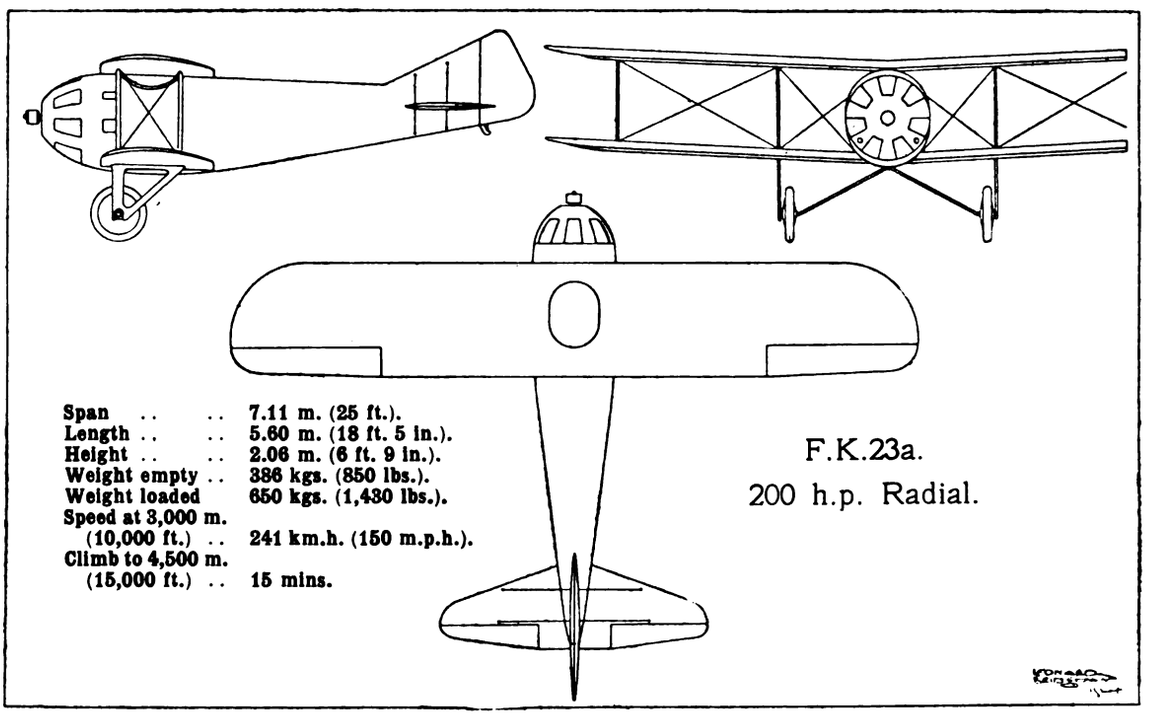
NATIONALE VLIEGTUIGINDUSTRIE—*continued.*



Span	7.11 m. (25 ft.).
Length	5.60 m. (18 ft. 5 in.).
Height	2.06 m. (6 ft. 9 in.).
Weight empty ..	386 kgs. (850 lbs.).
Weight loaded	650 kgs. (1,430 lbs.).
Speed at 3,000 m. (10,000 ft.) ..	241 km.h. (150 m.p.h.).
Climb to 4,500 m. (15,000 ft.) ..	15 mins.

F.K.23a.
200 h.p. Radial.

The controlability, ease of landing, range, performance, stability as a gun platform of the F.K.23 are known to all concerned with military aviation; the F.K.23a is on most points still better.

THE F.K.29.

The F.K.29 is a three-seater commercial light aeroplane fitted with a Bristol "Lucifer" engine, one of the most reliable engines now in being.

The object of the designer was to provide a machine suitable to supplement the big airliners when a small load should be carried over a long distance with the greatest possible reliability at the lowest cost.

The fuselage, which is entirely constructed of three-ply on ash longerons, provides a comfortable seat for two passengers and a pilot, and sufficient room to store the luggage for these. The chairs can easily be taken out and the machine can then be used as a freight-carrier, the load carried being 500 lbs., while the cubic capacity for these goods is 35 cub. ft.

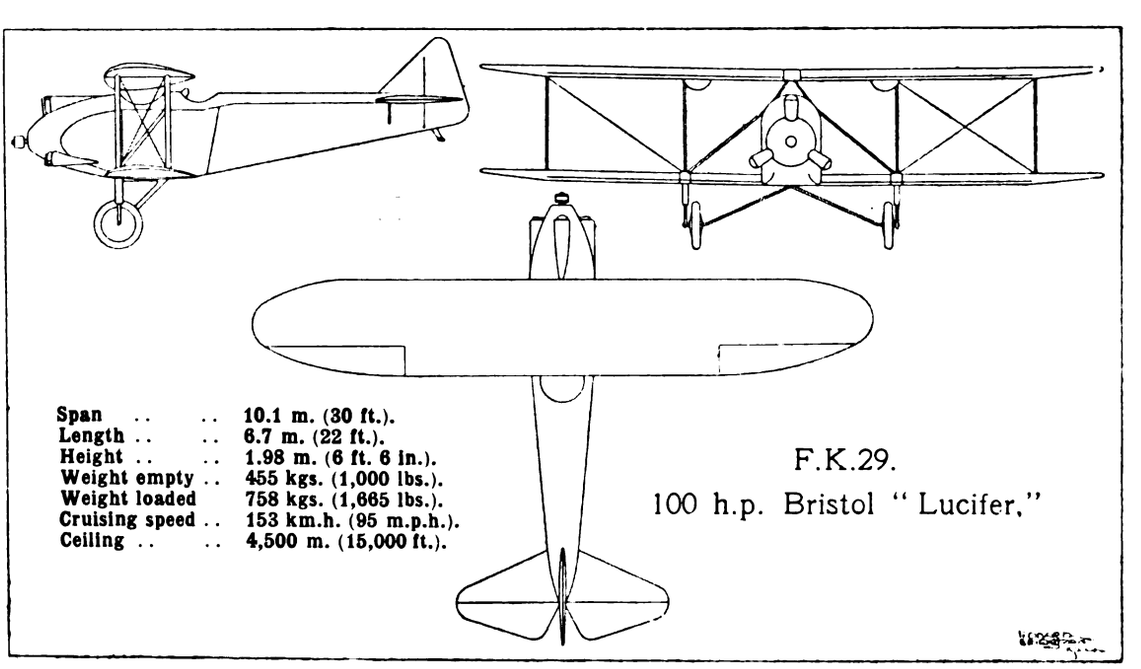
The landing chassis has a track of 10 ft. and is of the oleo non-recoil type, as first designed by Mr. Koolhoven in 1915.

The tail-skid is steerable, so that the combination of the wide oleo chassis and the steerable tail-skid provides for the maximum of safety when landing in small fields.

The wing structure is of great rigidity and the planes can be taken off in a very short time, enabling to store the machine in a small space.

All control surfaces are worked by steel tubes, eliminating all wear, so familiar with cables.

The quality of this machine, which is of pleasing lines, should also make it most suitable to be used on a hire or taxi service.



Span	10.1 m. (30 ft.).
Length	6.7 m. (22 ft.).
Height	1.98 m. (6 ft. 6 in.).
Weight empty ..	455 kgs. (1,000 lbs.).
Weight loaded	758 kgs. (1,665 lbs.).
Cruising speed ..	153 km.h. (95 m.p.h.).
Ceiling	4,500 m. (15,000 ft.).

F.K.29.
100 h.p. Bristol "Lucifer."

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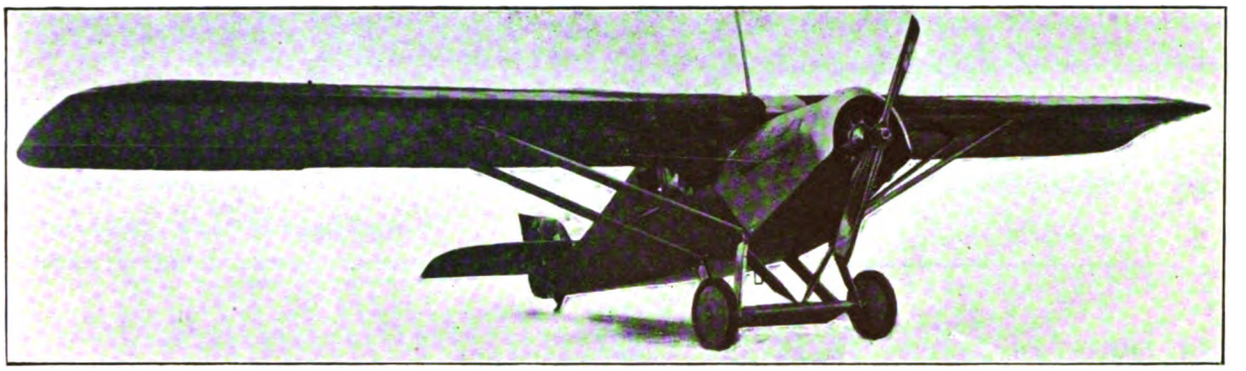
HUNGARY.



The Fiero Monoplane (110 h.p. Le Rhône engine.)

FEIRO.

The " Feiro I " monoplane was designed by Mr. Louis Rotter and was built as a private venture. It is the first commercial aeroplane constructed in Hungary since the peace.

The machine is a four-seater thick-winged monoplane fitted with a 110 h.p. Le Rhône engine. Both wings and body are plywood covered.

Specification.

Span	14.0 m. (45 ft. 10 in.).
Length	7.5 m. (24 ft. 7 in.).
Height	2.75 m. (9 ft. 4 in.).
Chord	2.0 m. (6 ft. 7 in.).
Wing area	28 sq. m. (302 sq. ft.).
Weight empty	660 kgs. (1,452 lbs.).
Weight loaded	1,100 kgs. (2,420 lbs.).
Wing loading	39.4 kgs./sq. m. (8 lbs./sq. ft.).
Power loading	9.17 kgs./h.p. (20 lbs./h.p.).
Max. speed	160 km.h. (100 m.p.h.).
Climb to 1,000 m. (3,280 ft.)	6 mins.

NIEUSCHLOSS-SICHTIG.

Nieuschloss-Sichtig Aeroplane Works, Albertfalva.

These works produced in 1923 two school machines, one designed by Bela Oravecz and George Szebeny jointly, the other by Bela Oravecz.

THE ORAVECZ-SZEBENY MONOPLANE.

A side-by-side two-seat monoplane. The wing, built in one piece, is rigidly braced at about one-third of the half span from the body by steel tubes running to the top of the undercarriage struts. The fuselage is plywood covered and rectangular in section. The machine is fitted with a 6-cylinder vertical water-cooled engine of 100 h.p.

Specification.

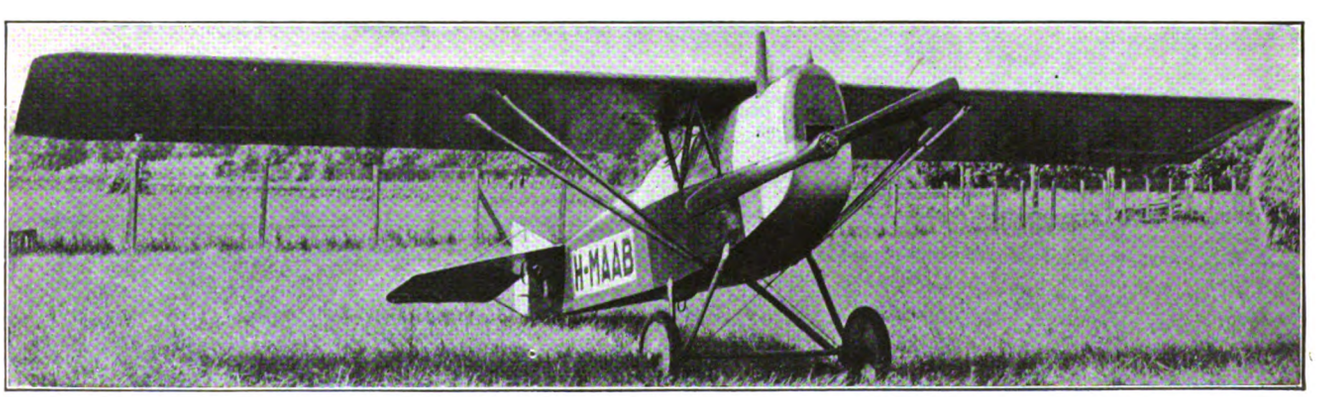
Span	11.4 m. (37 ft. 3 in.).
Weight empty	580 kgs. (1,276 lbs.).
Weight loaded	800 kgs. (1,760 lbs.).
Max. speed	140 km.h. (87 m.p.h.).
Climb to 1,000 m. (3,280 ft.)	6½ mins.

THE ORAVECZ MONOPLANE.

Practically a tandem-seated version of the above type.

Specification.

Span	11.75 m. (28 ft. 6 in.).
Length	8.0 m. (25 ft. 3 in.).
Chord	2.0 m. (6 ft. 7 in.).
Wing area	22 sq. m. (237 sq. ft.).
Weight empty	645 kgs. (1,419 lbs.).
Weight loaded	880 kgs. (1,936 lbs.).
Wing loading	40 kgs./sq. m. (8.2 lbs./sq. ft.).
Power loading	8.8 kgs./h.p. (19.4 lbs./h.p.).
Max. speed	160 km.h. (100 m.p.h.).
Climb to 1,000 m. (3,280 ft.)	6 mins.



The Oravecz School Monoplane.

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ITALY.

A

ANTONI.

Societa Italiana Brevetti Antoni.
Firenze and Pisa (Coltano).

A new firm to exploit the designs of the Brothers Antoni.

During 1922 has been engaged in building experimental machine to the designs of Ing. Guido Antoni. The special characteristic is the use of a variable camber wing—concerning which no details are available.

The machine was completed in 1923 but no photograph or description is available. The main characteristics are reported to be as follows :—

Specification.

Type	**Biplane.**
Span	**12 m. 50 (41 ft.).**
Length	**8 m. (25 ft. 2 in.).**
Height	**2 m. 70 (8 ft. 10 in.).**
Wing area	**44 sq. m. (473 sq. ft.).**
Engine	**S.P.A., 200 h.p.**
Weight empty	**1,200 kgs. (2,640 lbs.).**
Weight loaded	**1,350 kgs. (2,970 lbs.).**
Wing loading	**30.7 kgs./sq. m. (6.3 lbs./sq. ft.).**
Power loading	**6.75 kgs./h.p. (14.8 lbs / h.p.).**
Estimated speed	**190 km.h. (118 m.p.h.).**
Estimated minimum speed	**60 km.h. (37 m.p.h.).**
Ceiling	**10,800 m. (35,000 ft.).**

ANSALDO.

Societa Anonima Aeronautica Ansaldo, Turin.

The great engineering and shipbuilding firm of Gio. Ansaldo & Co. entered the aircraft industry late in the War by producing the S.V.A. biplanes. These machines were so known from the initials of the two designers, Savoia and Verduzzio, and that of the manufacturing firm.

After the peace, a separate firm, under the title given above, was formed to deal with aircraft business.

The S.V.A. and a later product, the Balilla or Ansaldo I, were described in the 1919 edition of this Annual, under the heading of S.V.A.

THE ANSALDO 300 BIPLANE.

The Ansaldo Works, in 1921, produced a modification of their type 300 biplane, essentially for civilian use. In tests carried out by Sig. Mario Stoppani, the 300C., as this machine is called, has given some very satisfactory results.

It is a single-engined tractor biplane of the totally enclosed type and has accommodation for pilot, mechanic and four passengers. This machine was described in some detail in the previous volume. From it has been developed the later type illustrated.

THE ANSALDO TYPE 201.

This is a single-engined single-seater biplane designed in two varieties—one as a light bomber and the other for mail carrying work. It was flown by Ferrarin in the Coppa d'Italia contest, and distinguished itself by its low minimum flying speed of 74/76 km.h. with full load.

Specification.

Span	**10.96 m. (36 ft.).**
Length	**8.30 m. (27 ft. 2½ in.).**
Height	**2.79 m. (9 ft. 1½ in.).**
Chord	**1.95 m. (6 ft. 3½ in.).**
Gap	**1.60 m. (5 ft. 3 in.).**
Area	**35.8 sq. m. (385 sq. ft.).**
Engine	**200 h.p. S.P.A.**
Weight empty	**780 kgs. (1,716 lbs.).**
Weight loaded	**1,280 kgs. (2,876 lbs.).**
Wing loading	**35.8 kgs./sq. m. (7.3 lbs./sq. ft.).**
Power loading	**6.4 kgs./h.p. (14.1 lbs./h.p.).**
Max. speed	**180 km.h. (112 m.p.h.).**
Fuel capacity	**4½ hours.**

THE ANSALDO TYPE S.

The Ansaldo S differs from the type 201 only in regard to the seats and low minimum flying speed of 60 km.p.h. (37 miles).

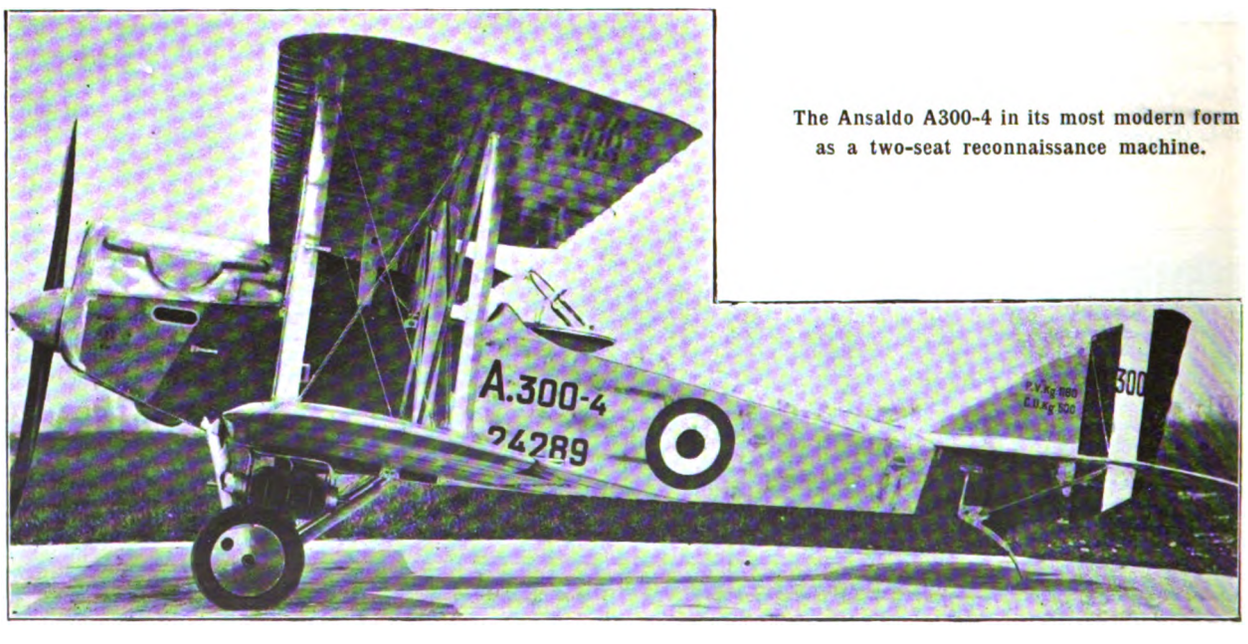
It is a two-seater biplane used for touring and advanced training work.

THE ANSALDO SPORTING MACHINE.

The firm is at present building a small aeroplane intended for school, practice and sport purposes.

It is a two-seater machine fitted with an Ansaldo motor-car engine of 40/50 h.p.

No details of construction or specification are available.



The Ansaldo A300-4 in its most modern form as a two-seat reconnaissance machine.

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ANSALDO—*continued.*

The Ansaldo A300T Passenger Carrier.

B

BASTIANELLI.

La Compagnia Bastianelli, Rome.

This firm has been wound up and rights in its aircraft products have passed to the Pegna-Bonmartini firm. The Pegna Bonmartini firm was in turn absorbed by Piaggio & Co., Genoa.

BREDA.

Società Italiana Ernesto Breda, Milan and Sesto S. Gio., Milan.

This enormous Milanese concern went in for building aircraft parts and accessories to a great extent during the War. Large numbers, too, of the complete 600 Caproni machines emanated from their shops.

In the firm's engine works at Milan, under the management of Engineer Luigi Arisi, the V6 Isotta Fraschini engines were built in a modified type, by many thought to be an improvement on the originals in accessibility.

The firm showed an engine with eight cylinders V of 320 h.p. at the Taliedo Aero Show, 1920, and produced the minute Pensuti triplane described in earlier issues. They have since produced the machine hereafter described.

THE BREDA-CASTALDI FOUR-ENGINED MACHINE.

This machine has been designed in two varieties—one as a seventeen-passenger commercial machine and the other as a heavy bomber. The two machines are of generally similar overall dimensions. The machine is understood to be of the normal central fuselage type with two groups of twin tandem engines on each side of the wings. No photographs or detailed descriptions—other than the specification—are available.

Specification.

Span	**27 m. (68 ft. 7 in.).**
Length	**15 m. 17 (49 ft. 9 in.).**
Height	**4 m. 82 (15 ft. 9 in.).**
Wing area	**160 sq. m. (1,720 sq. ft.).**
Weight empty	**4,000 kgs. (8,800 lbs.).**
Weight of fuel	**1,000 kgs. (2,200 lbs.).**
Passengers and crew	**1,400 kgs. (3,080 lbs.).**
Weight loaded	**6,400 kgs. (1,4080 lbs.).**
Engines	**4—S.P.A.6a, 200 h.p. each.**
Wing loading	**40 kgs./sq. m. (8.25 lbs./sq. ft.).**
Power loading	**8 kgs./h.p. (17.6 lbs./h.p.).**
Max. speed	**190 k.p.h. (118 m.p.h.).**
Stalling speed	**75 k.p.h. (47 m.p.h.)**
Climb to 1,000 m. (3,280 ft.).	**5 mins.**
Climb to 3,000 m. (9,740 ft.).	**30 mins.**

C

CAPRONI.

Società Per Lo Sviluppo Dell'Aviazione in Italia. Milano-Taliedo, Vizzola-Ticino and Sesto Calende.

Designer: Comm. Gianni Caproni.
Managing Director: Dr. Federico Caproni.
Business Manager: Dr. Emanuele Segre.

The city address of the firm is Passaggio Carlo Alberto, 2, Milan.

Commendatore Ing. Gianni Caproni is to the Italian mind all that is rarest in patriotism and aviation.

He was born at Massone, in the Trentino, in 1886, and is thus of that region the release of which, from foreign bondage, Italy ever aspired.

Caproni at 17 was deep in his studies for the diploma of civil engineer at Munich, having obtained which the following years saw him first at Liege studying electrical engineering, then at Paris devoting himself to aeronautics with his contemporary and friend, Coanda.

It was in France that the first of his biplanes was designed; but the first failure was that met in an attempt to get financial backing to build it somewhere in the early part of 1909, when on a visit to his native country.

So he returned to Belgium and theory, and only in the following year was it found possible to build the machine—which flew at the first trial.

From then onwards, he took up his quarters at Malpensa (Vizzola), on that lonely heath, not unfrequently then used as a manœuvring ground in the summer for cavalry, which was lent him by the War Office.

Little was heard of the brothers Caproni—he had been joined by an elder brother, Dr. Fred. Caproni—by the public, but a quiet and great work was carried through in the following years, culminating in the unavoidable publicity caused by the record-breaking monoplane's performance abroad. (Vienna, 25/6/12.) This was the machine which was used for military purposes by the Italian Government just before the monoplane ban.

Several widely differing types of biplanes had been evolved during 1910 and 1911; the last (tractor) with doubly cambered wings and tail-incidence variable during flight, an instructive but not effective machine.

Aero-dynamic experiments of all sorts were tried, e.g., the effects of flexible surfaces, dihedral supporting and control surfaces, side areas, body length, but especially in elicology a real pleasure to Signor Caproni this last.

Twin engines, a machine with two engines to be used alternately, dual propeller action, skin friction and indeed every problem that was only to be resolved by experiment on full-sized machines, was gone into in practice, and reliable theory extracted from the results. It is worthy of note, however, that the forward position of the engine was from the beginning the only one for Ing. Caproni.

From these data the first 300 h.p. three-engined biplane rose to conquer in 1914, met, as one might have expected, with some scepticism by the country at first.

From this Caproni developed the three-engined triplane bomber of the war, which with various modifications became a peaceful passenger carrier.

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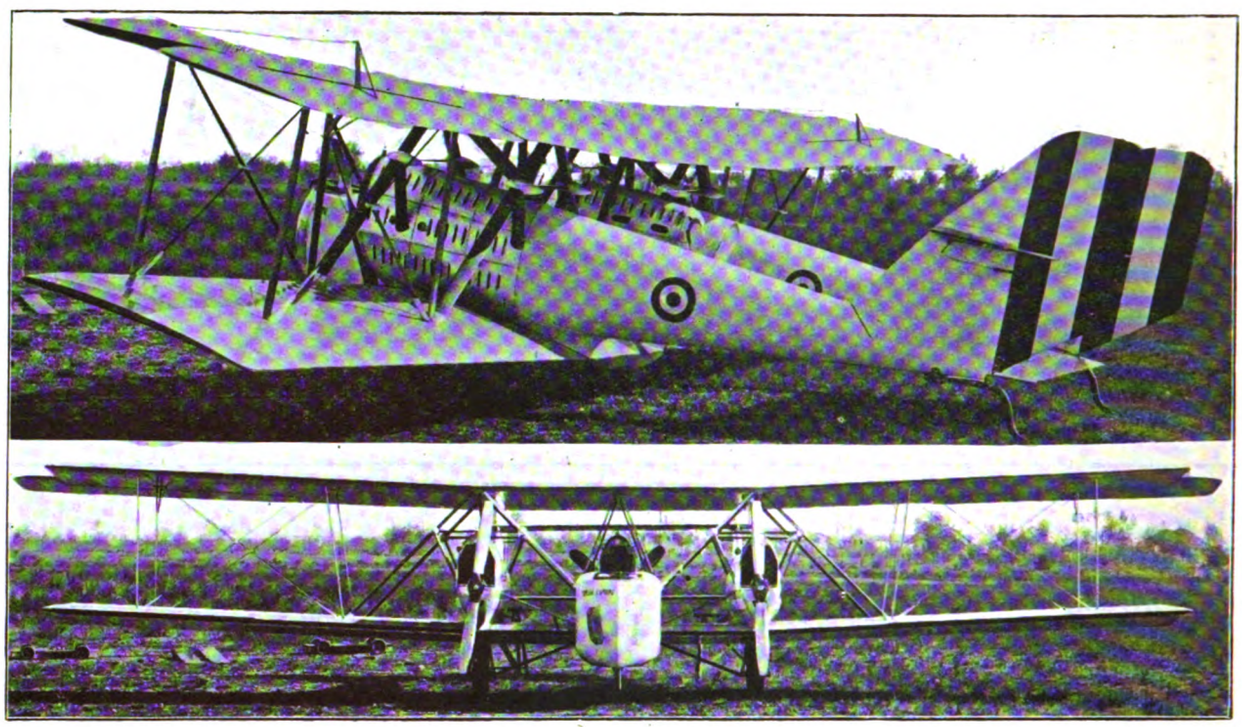
CAPRONI—*continued.*



The 1923 type Twin Fuselage Triple-engine Caproni.

An enormous triple triplane flying boat was produced in 1920/21, and was described in last year's volume. In the autumn of 1922 work was begun on a modern design of the same general type as the earlier three-engined machines

THE 1923 CAPRONI.

This machine, as may be seen in the attached drawings, incorporates the three-engined arrangement originally devised by Caproni, and is therefore a normal development of the earlier types of this make. The general design, however, has been greatly revised and brought up-to-date, so that the present example bears no resemblance in detail to the well-known bird-cage arrangement of its predecessors.

The twin-fuselages, each with its tractor screw, are of excellent streamline form, and carry at their ends a biplane tail and very ample fins and rudders.

The central nacelle is dropped below the lower wing, and serves to carry a front wheel for landing purposes. This arrangement permits the use of a very simple and clean under-carriage arrangement. The third engine is installed at the after end of this nacelle.

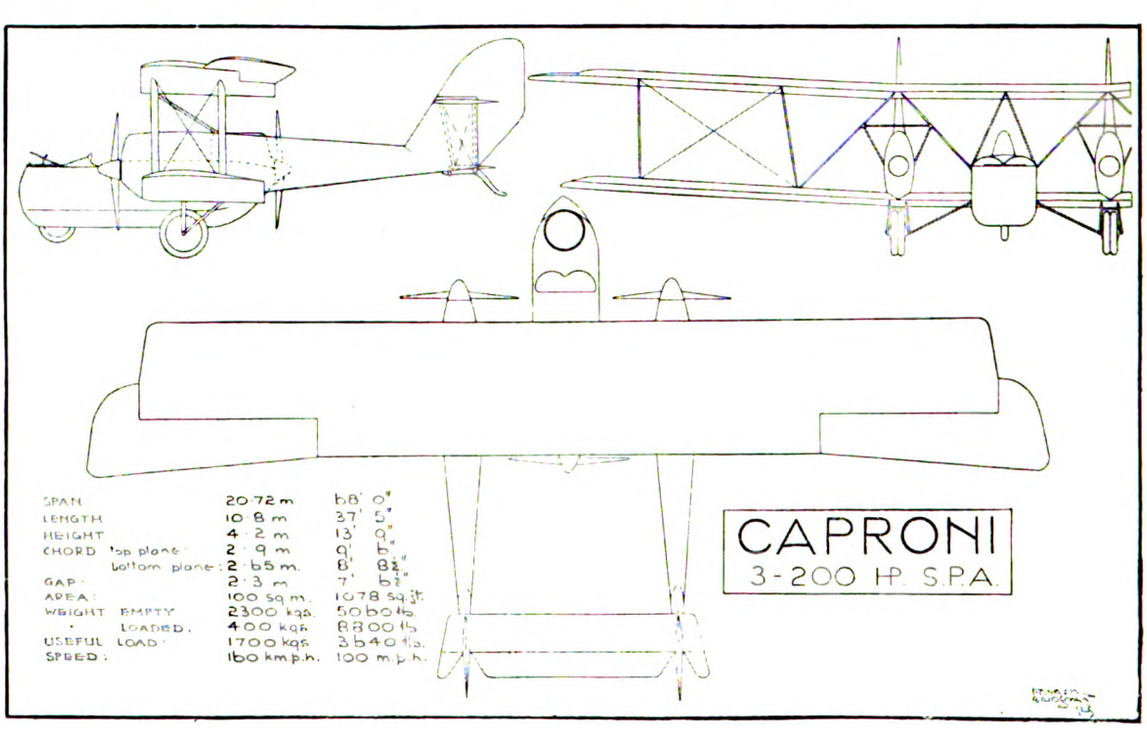
The machine shewn in the drawing is equipped as a bomber. Alternatively, the central nacelle may be fitted with a cabin for eight passengers. The machine may be fitted either with three 200 h.p. S.P.A. engines, or with three Isotta-Fraschini of 180 h.p. each. As a passenger machine, tanks for four hours' flight are fitted.

An interchangeable float undercarriage can be fitted to this type in a very short time.

The drawing reproduced gives the main data concerning this type.

THE CAPRONI FOUR-ENGINED NIGHT BOMBER.

A more recent design in which the conventional single fuselage with engines in nacelles on the wings has been adopted is shown in a scale drawing on next page.


SPAN 20·72 m 68' 0"
LENGTH 10·8 m 37' 5"
HEIGHT 4·2 m 13' 9"
CHORD top plane 2·9 m 9' 6"
bottom plane 2·65 m. 8' 8½"
GAP 2·3 m 7' 6½"
AREA 100 sq m. 1078 sq ft
WEIGHT EMPTY 2300 kgs. 5060 lbs.
LOADED. 4000 kgs 8800 lbs.
USEFUL LOAD 1700 kgs 3840 lbs.
SPEED 180 km p.h. 100 m.p.h.
CAPRONI
3-200 HP. S.P.A.

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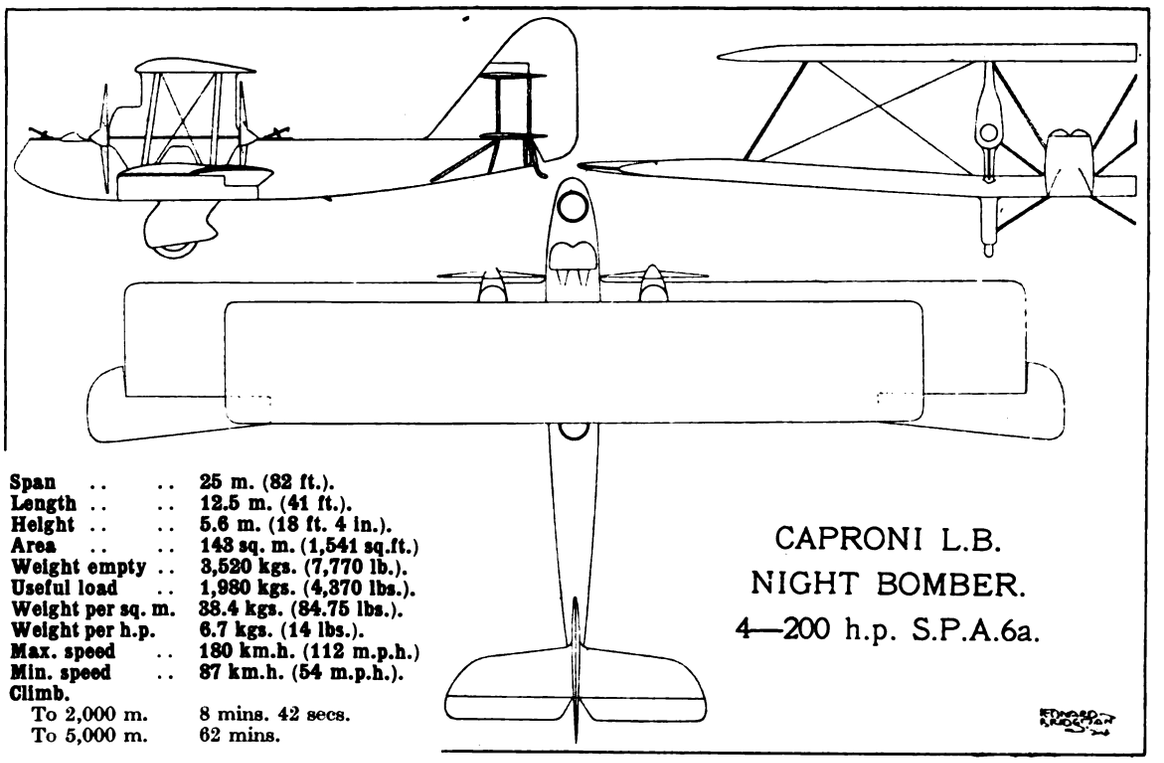
***CAPRONI**—continued.*



Span	**25 m. (82 ft.).**
Length	**12.5 m. (41 ft.).**
Height	**5.6 m. (18 ft. 4 in.).**
Area	**143 sq. m. (1,541 sq.ft.)**
Weight empty ..	**3,520 kgs. (7,770 lb.).**
Useful load ..	**1,980 kgs. (4,370 lbs.).**
Weight per sq. m.	**38.4 kgs. (84.75 lbs.).**
Weight per h.p.	**6.7 kgs. (14 lbs.).**
Max. speed ..	**180 km.h. (112 m.p.h.)**
Min. speed ..	**87 km.h. (54 m.p.h.).**
Climb.	
To 2,000 m.	8 mins. 42 secs.
To 5,000 m.	62 mins.

CHIRIBIRI. A. Chiribiri e C, Borgo S. Paolo, Via Caraglio, and Via Montenegro, Turin, and Stabilimenti già Nazarro; Borgata Cenisia, Corso Peschiera No. 250, Turin.

Made many interesting experimental monoplanes on which several Italian Records were broken. Now engaged on motor work exclusively.

F

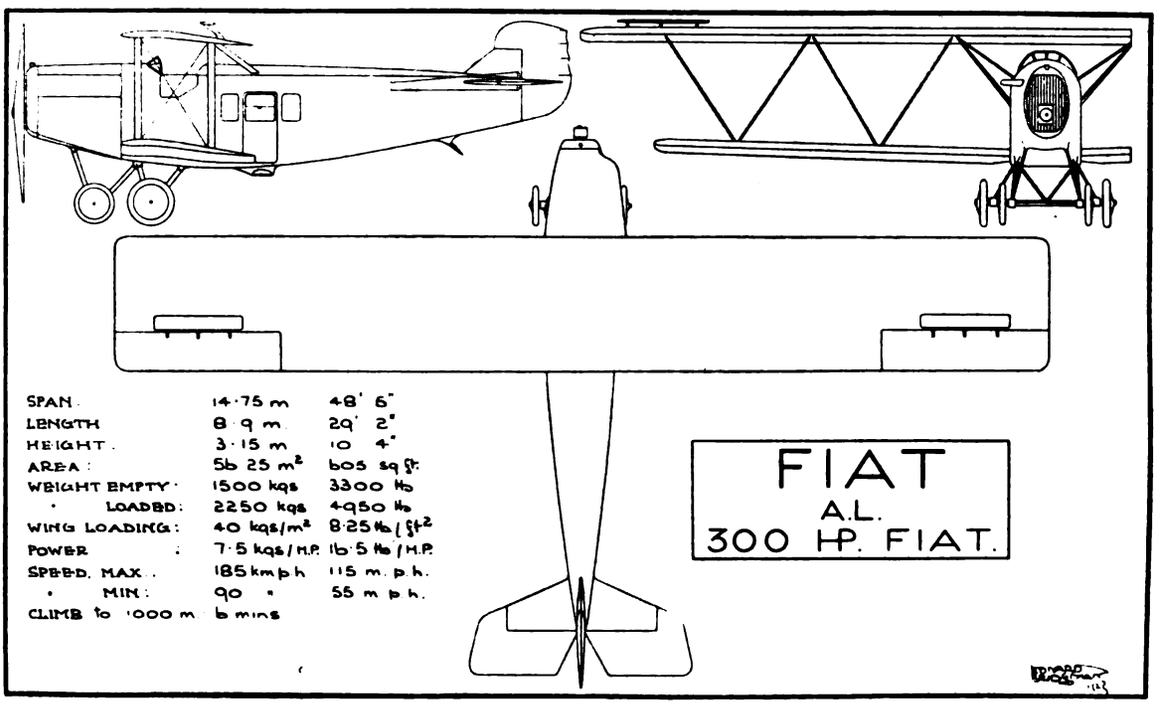
FIAT.

Società Anonyma F.I.A.T., Corso Dante 35, Turin.

The famous Italian builders of automobiles and of aero-engines. The aircraft building branch of their business was, during the War, known as the S.I.A. (Societa Italiano Aviazone), but it has now dropped this title and is known by the name of the parent firm.

Of their products the earlier S.I.A's and the Fiat B.R. were described and illustrated under the S.I.A. heading in the 1919 edition of this Annual. Since that date a modified version of the B.R., known as the A.R.F. (Aeroplan-Rosatelli-Fiat), the R representing the name of the designer has been built. The main difference between this and the ancestral B.R. consists in the increased fuel capacity, combined with some detail refinements leading to reduced structure weight and increased speed, and the provision of an aileron balancer of a type used in this country by the Avro firm. This machine was described and illustrated in earlier volume.

The new commercial machines described below, may be regarded as a development of the same type.


SPAN 14·75 m 48' 6"
LENGTH 8·9 m 29' 2"
HEIGHT 3·15 m 10 4"
AREA 56 25 m² 605 sq ft
WEIGHT EMPTY 1500 kgs 3300 lb
LOADED 2250 kgs 4950 lb
WING LOADING 40 kgs/m² 8·25 lb/ft²
POWER 7·5 kgs/H.P. 16·5 lb/H.P.
SPEED MAX. 185 km p h 115 m. p. h.
MIN. 90 55 m p h.
CLIMB to 1000 m 6 mins
FIAT
A.L.
300 H.P. FIAT.

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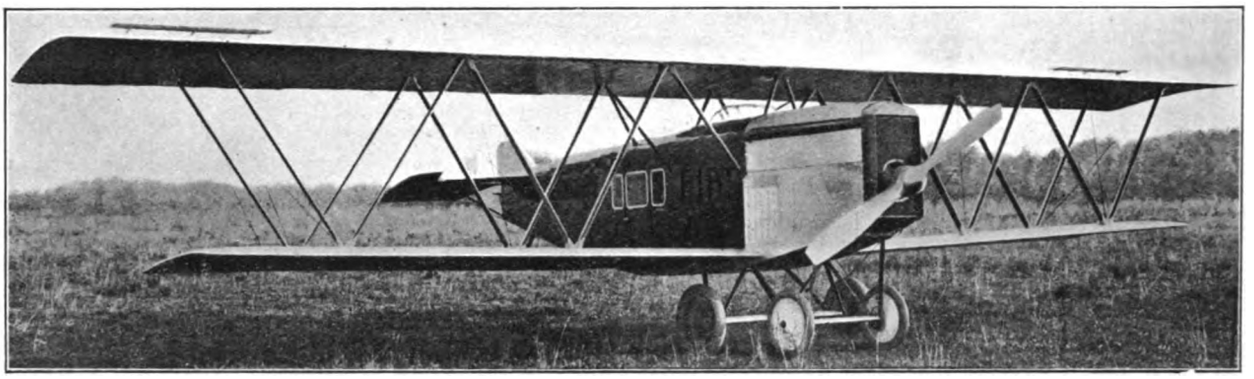
FIAT—*continued.*



The Fiat A.L., a 300 h.p. passenger carrier, shown in a scale drawing on the previous page.

THE FIAT A.L.

This machine is of very similar general type to the larger commercial Fiats previously mentioned. It is a cabin type commercial machine, with an open cockpit for the pilot and one other below the centre section, and a cabin for four passengers behind the wings.

The machine has the rigid warren truss bracing to the wings, characteristic of the earlier types—and the "Avro type" aileron balances.

The undercarriage is of the four-wheeled type and is stated to have proved to be exceedingly strong.

The general appearance and the main dimensions are given on the drawing reproduced.

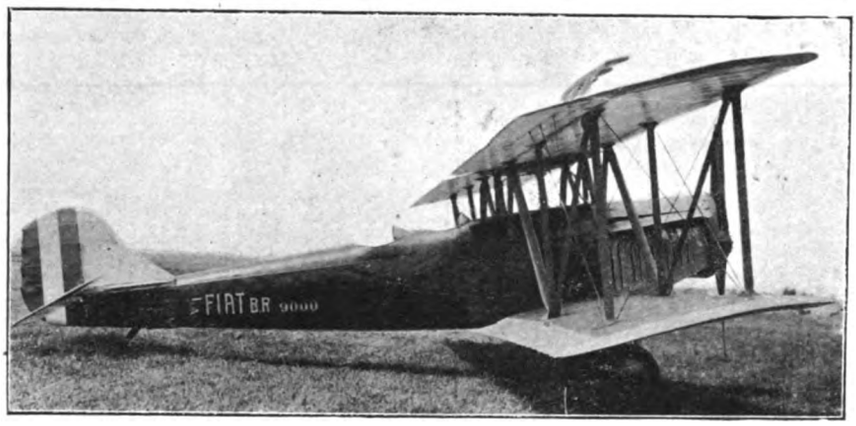
The big 700 h.p. B.R. machine, is still produced as a standard bomber and long range reconnaissance machine.

THE FIAT C.R.

This is a single-seat fighter, fitted with the 300 h.p. Hispano. It is equipped with twin machine-guns firing forward. See scale drawing for specification.

THE FIAT R.S.

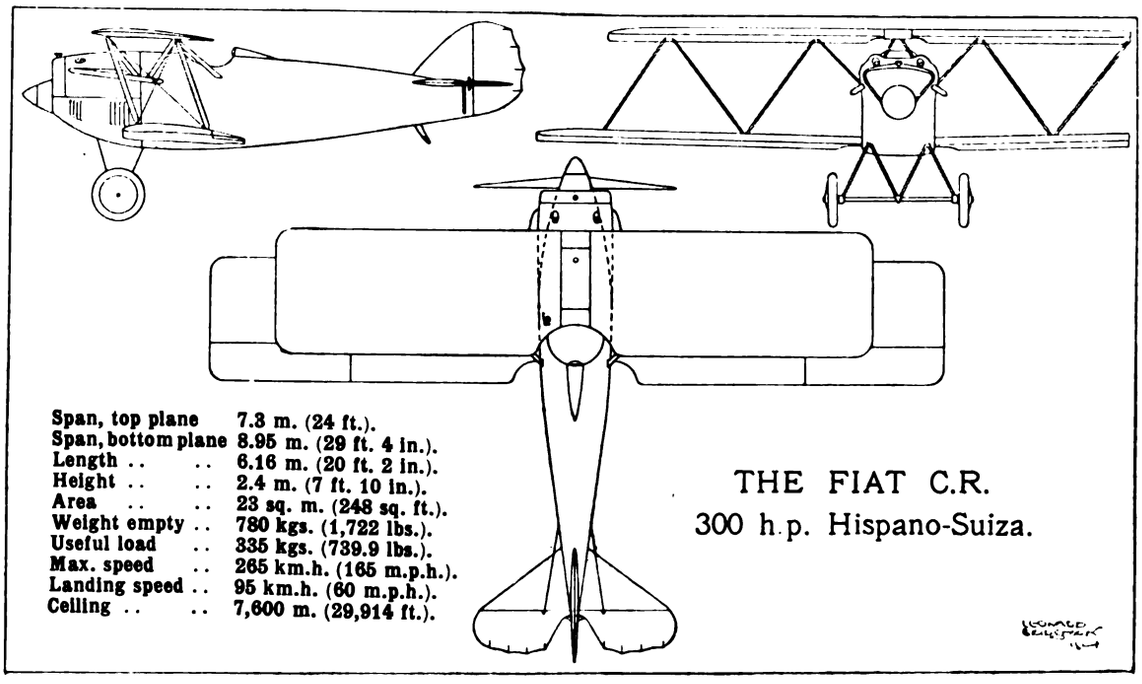
A two-seater general utility machine, intended for photographic reconnaissance, artillery direction or the like. The machine greatly resembles the C.R. type. Carries one forward and one after machine-gun and is fitted for wireless and photography.



The Fiat B.R. (700 h.p. Fiat engine).

Specification.

Span, top wing	9.20 m. (30 ft. 2 in.).
Span, lower wing	11.20 m. (36 ft. 10 in.).
Height	2.85 m. (9 ft. 4 in.).
Length	7.55 m. (24 ft. 9 in.).
Area	36 sq. m. (388 sq. ft.).
Weight empty	1,000 kgs. (2,207 lbs.).
Useful load	600 kgs. (1,324 lbs.).
Weight per sq. m.	44.5 kgs. (98.2 lbs.).
Weight per h.p.	5 kgs. (11.1 lbs.).
Tank capacity	3½ hours.
Max. speed, low down	240 km.h. (150 m.p.h.).
Ceiling	5,700 m. (18,700 ft.).
Climb.	
To 4,000 m. (12,180 ft.)	21 mins.



Span, top plane	7.3 m. (24 ft.).
Span, bottom plane	8.95 m. (29 ft. 4 in.).
Length	6.16 m. (20 ft. 2 in.).
Height	2.4 m. (7 ft. 10 in.).
Area	23 sq. m. (248 sq. ft.).
Weight empty	780 kgs. (1,722 lbs.).
Useful load	335 kgs. (739.9 lbs.).
Max. speed	265 km.h. (165 m.p.h.).
Landing speed	95 km.h. (60 m.p.h.).
Ceiling	7,600 m. (29,914 ft.).

THE FIAT C.R.
300 h.p. Hispano-Suiza.

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G

GABARDINI.

Società Incremento Aviazione, Cameri, Novara.

Signor Gabardini, who at one time dedicated himself to art of another sort, is a Piemontese by birth, and cruelly crippled, mental energy alone being in his power of recent years. He has, however, the satisfaction of having produced one of the very few monoplanes which survived the ban and disfavour into which single-deckers fell before the war and his joy therein is shewn by the pride with which he claims it the best, after trial, in all the world.

The *Garbardini* type of monoplane took the competent by storm when it first appeared in 1913 to the public.

With two adult passengers and an 80 h.p. rotary engine, the late Philip Cevasco made a non-stop flight from Milan to Venice, and otherwise proved the powers of the machine to be quite exceptional and unusually well suited for all sorts of general conditions.

With a smaller engine, the *Gabardini* was found to be ideal for training pilots, and so a large school and works were opened at Cameri, in 1914, and were got into swing in time for the work of preparation for war.

Squat and inelegant and built largely of metal, the monoplanes are distinctive, not freakish nor reminiscent of any other aeroplane.

The type had a long testing during four war years of gruelling, with barely a modification, and that in the cockpit, in all that time.

The work of training some 300 pilots carried on at Cameri kept Signor Gabardini's designing energy rather in the background necessarily, and the only novel machine produced since the war is the little triplane described in last years volume. It is understood that the firm now have in hand the construction of an all metal fighting machine, but no details are available.

M

MACCHI.

Società Anonima Nieuport-Macchi. Varese.

Founded in 1912 as an exclusively aeronautical concern and produced before the war certain "parasol" types with great success, creating records for Italian aviation about the time other nations were mobilizing.

But for the preparedness of Ing. Guilio Macchi, and the organization which allowed this firm to construct even more Nieuports than the Italian Army called for, this country's position in the air at the beginning of the war might have been very serious. Therefore one understands that the Allied Forces owe individually a considerable debt to the Macchi concern.

The latter part of the war saw the firm's flying boats in very general use both on active service and on home waters for training purposes.

Messrs. Nieuport-Macchi are continuing to supply the demand for their seaplanes and to prepare new types, both military and commercial, of promising kinds. Their latest products are hereafter described.

THE MACCHI 7.ter.

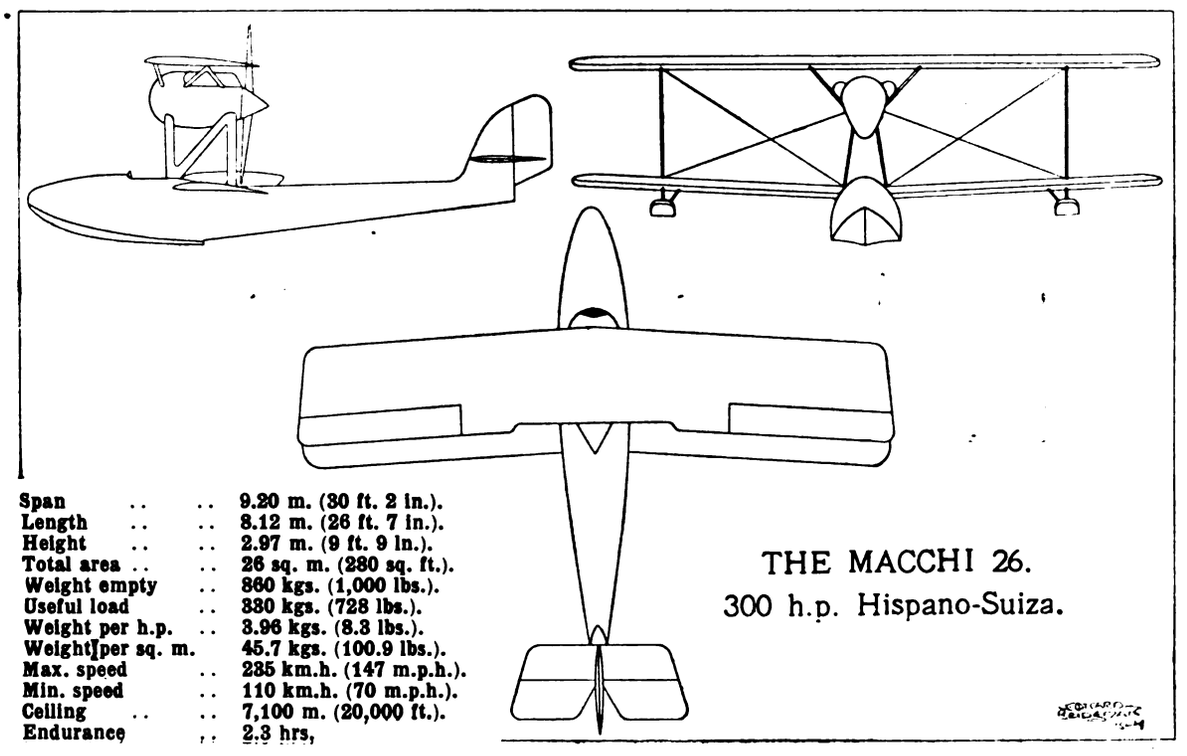
This machine is a modified edition of the M.7 and is intended for pursuit purposes. It differs mainly in the hull design, which in the new type is of the M.17 type.

The only available data are given below :—

Area	**23.5 sq. m. (253 sq. ft.).**
Weight empty	**780 kgs. (1,720 lbs.).**
Useful load	**300 kgs. (662 lbs.).**
Speed, low down	**210 km.h. (131 m.p.h.).**
Speed at 2,000 m.	**132 km.h. (82.5 m.p.h.**
Minimum speed	**95 km.h. (60 m.p.h.).**
Tank capacity	**5 hours.**
Climb.	
To 1,000 m. (3,278 ft.)	4 mins. 15 secs.
To 3,000 m. (9,834 ft.)	12 mins. 15 secs.
To 5,000 m. (16,390 ft.)	28 mins.

THE MACCHI 26.

Experimental pursuit flying-boat building to the order of the Italian Government.



THE MACCHI 26.
300 h.p. Hispano-Suiza.

Span	**9.20 m. (30 ft. 2 in.).**
Length	**8.12 m. (26 ft. 7 in.).**
Height	**2.97 m. (9 ft. 9 in.).**
Total area	**26 sq. m. (280 sq. ft.).**
Weight empty	**860 kgs. (1,000 lbs.).**
Useful load	**330 kgs. (728 lbs.).**
Weight per h.p.	**3.96 kgs. (8.3 lbs.).**
Weight per sq. m.	**45.7 kgs. (100.9 lbs.).**
Max. speed	**235 km.h. (147 m.p.h.).**
Min. speed	**110 km.h. (70 m.p.h.).**
Ceiling	**7,100 m. (20,000 ft.).**
Endurance	**2.3 hrs,**

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MACCHI—continued.

THE MACCHI 24.

A twin tandem-engined bomber produced early in 1924. The machine has the normal type of Macchi hull, with a somewhat steep Vee bottom. The wings are of the rigidly braced Warren truss biplane type, the upper wing having a considerably greater span than has the lower. The two engines are 300 h.p. A12 bis Fiats mounted centrally in tandem.

Specification.

Span	**22.0 m. (72 ft. 3 in.).**
Length	**13.7 m. (45 ft.).**
Height	**4.65 m. (15 ft. 3 in.).**
Wing area	**90 sq. m. (968 sq. ft.).**
Weight empty	**2,970 kgs. (6,540 lbs.).**
Weight loaded	**4,515 kgs. (9,950 lbs.).**
Wing loading	**50.1 kgs./sq. m. (10.2 lbs./sq. ft.).**
Power loading	**7.8 kgs./h.p. (16.1 lbs./h.p.).**
Max. speed	**180 km.h. (112 m.p.h.).**
Climb to 3,000 ft. (9,840 m.)	**50 mins.**
Ceiling	**3,500 m. (11,500 ft.).**

MONFALCONE.

Cantieri Navali di Monfalcone.

The famous firm of shipbuilders entered aircraft industry late in 1923. At the time of writing, are building a racing seaplane for the 1924 Schneider Cup race.

P

PEGNA-BONMARTINI.

Construzioni Navali-Aeronautiche. Offices : Via Aurora N.45, Rome. Works : Via Ostiense N.91-93, Rome.

The firm has now been taken over by Piaggio & Co., Genoa.

PIAGGIO-PEGNA.

Società Anonima Piaggio & Co., Genoa, Sestri Ponente, Finalmarina, Pisa and Rome.

Head office : 14, Via Caffaro, Genoa.

The famous firm of engineers and shipbuilders entered the aircraft industry in the War by producing several Caproni machines and building aircraft parts and accessories.

After the peace, aircraft manufacture was abandoned, but on August 8, 1923, the firm took over the aeronautical work of Messrs. Pegna & Bonmartini, of Rome, and entered the aircraft industry again.

THE PIAGGIO-PEGNA PURSUIT MONOPLANE.

This machine is a single-seat fighter. It is an all-wood cantilever monoplane with the wing at the bottom of the fuselage. The fuselage is of oval section, built on formers and spruce longerons and covered with three-ply. The wing is built in one unit, and may be easily removed by undoing the bolt coupling it to the fuselage.

The machine is armed with two synchronised machine-guns and is being built to the order of the Italian Government.

This machine has successfully passed its initial tests.

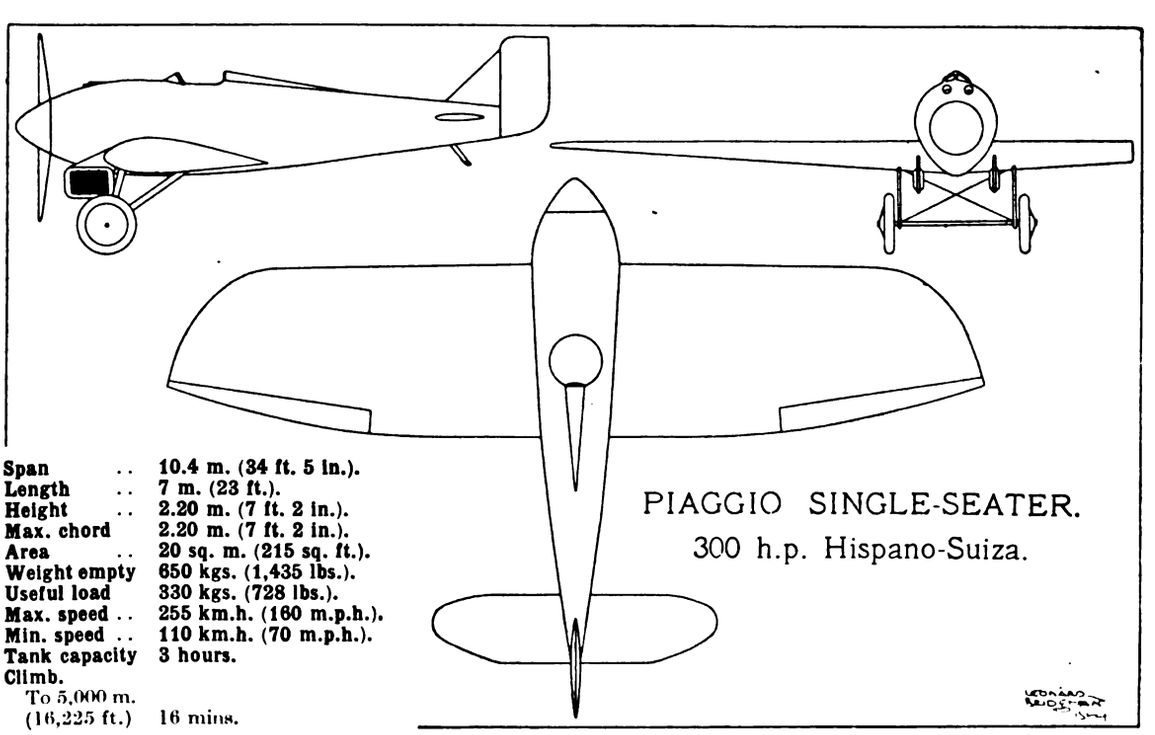
THE PIAGGIO-PEGNA B.N.2 TYPE.

This machine is a four-engined biplane ordered by the Italian Government.

Specification.

Span	**24 m. (80 ft.).**
Length	**14.50 m. (47 ft. 6 in.).**
Height	**3.75 m. (12 ft. 2 in.).**
Area	**140 sq. m. (1,600 sq. ft.).**
Engines	**4—200 h.p. S.P.A.6a.**
Weight empty	**3,600 kgs. (7,947 lbs.).**
Useful load	**1,900 kgs. (4,194 lbs.).**
Weight per h.p.	**6.7 kgs. (14.9 lbs.).**
Weight per sq. m.	**39.3 kgs. (86.2 lbs.).**
Performance estimated as follows:—	
Max. speed	184 km.h. (130 m.p.h.).
Climb.	
To 5,000 m. (16,390 ft.)	45 mins.

The Piaggio firm are also completing a dual control light aeroplane fitted with a 2-cylinder, 18 h.p. engine, designed by Ing. Pegna, and they are also building a racing seaplane for the 1924 Schneider Cup race.



PIAGGIO SINGLE-SEATER.
300 h.p. Hispano-Suiza.

Span	**10.4 m. (34 ft. 5 in.).**
Length	**7 m. (23 ft.).**
Height	**2.20 m. (7 ft. 2 in.).**
Max. chord	**2.20 m. (7 ft. 2 in.).**
Area	**20 sq. m. (215 sq. ft.).**
Weight empty	**650 kgs. (1,435 lbs.).**
Useful load	**330 kgs. (728 lbs.).**
Max. speed	**255 km.h. (160 m.p.h.).**
Min. speed	**110 km.h. (70 m.p.h.).**
Tank capacity	**3 hours.**
Climb.	
To 5,000 m. (16,225 ft.)	16 mins.

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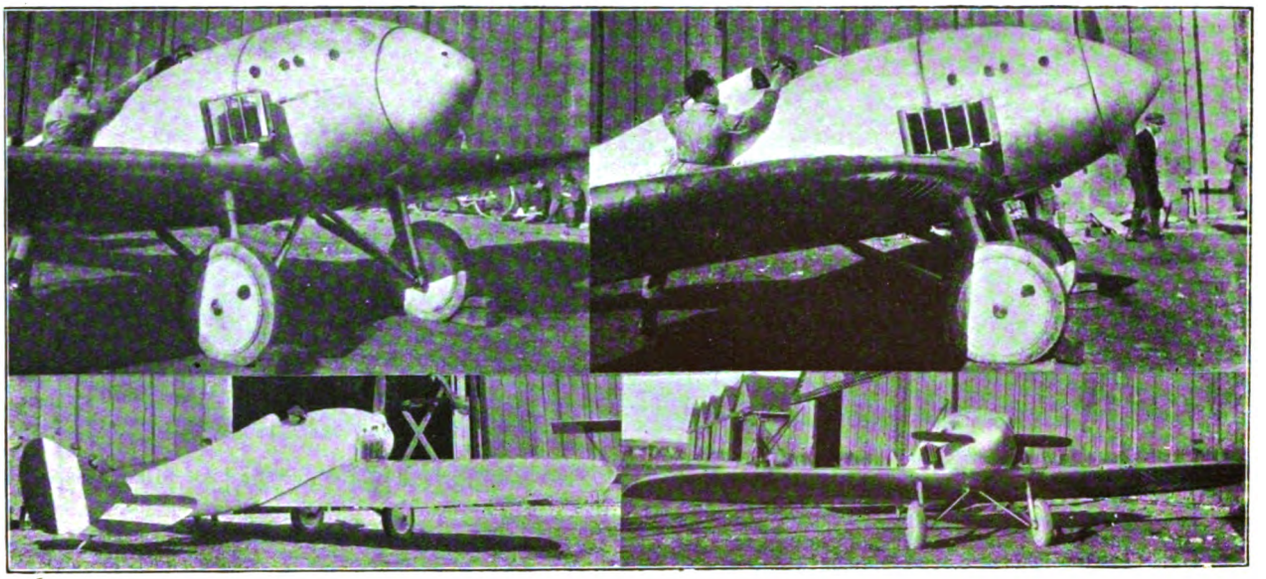
PIAGGIO—*continued.*



The Piaggio Single-seater.

R

RICCI.

Ricci Bros., Lac Lucrino, Baïa, Naples.

The firm has produced no new aircraft since those described in the last volume.

S

SAVOIA.

See *S.I.A.I.*

S.A.M.L.

Società Anonima Meccanica Lombarda, Monza, (via Cavalieri); Milan, via Broggi, No. 4.

This highly important firm of Military Contractors with its 4,500,000 lire of fully-paid up capital, and employing some 3,000 workmen, decided in 1913 to enter the aeroplane trade, and constructed as almost its first effort that "Amfiplane" which did as well as any of its competitors at the Military Trials of that year.

The S.A.M.L., after the entry of Italy into the European War, devoted most of its labour to supplying aeroplanes of its own special type with complete satisfaction to those most competent to judge.

The S.A.M.L. built a good school machine in large numbers and an *Aviatic* type, which, with Salmson motor, was at one time esteemed a very fast mount.

No fresh information is to hand.

SOCIETÁ DI CONSTRUZIONI MECCANICHE DI PISA.

Head office : 14, Via S. Lorenzo, Genoa.
Works : Marina di Pisa.

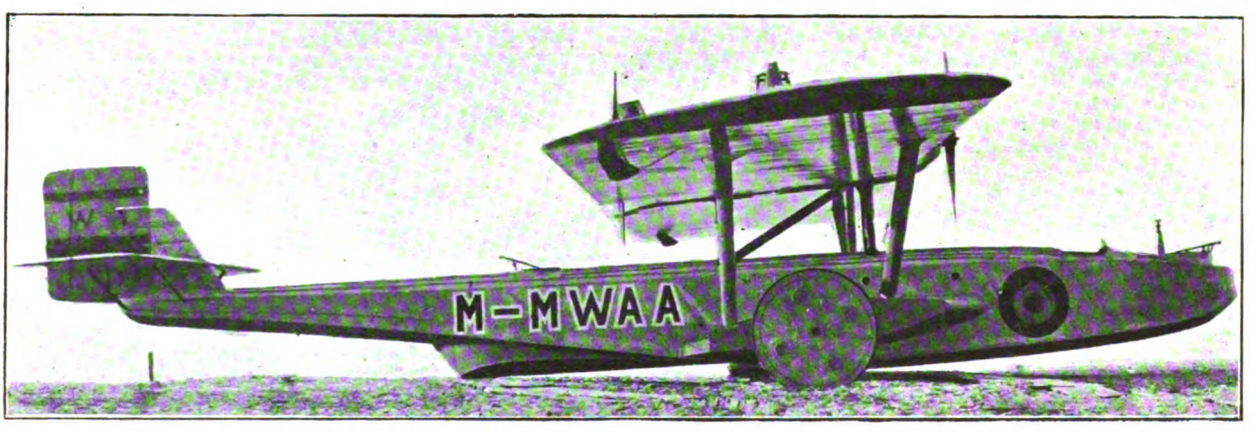
This firm was founded in 1922 to manufacture machines under licence from the Dornier designs. The chief director of the firm is Herr Schulte Frohlinde—a close associate of Ing. Dornier. The firm has purchased the works of the former Gallinari company. It produced, during 1922, six Hispano-Suiza-engined machines of the "Wal" type and two of the "Delphin" type for Spain.

The Dornier "Falke" single-seat fighter is also to be built—it is believed to the order of the U.S. Government.

For particulars of the Dornier types see the heading "Dornier" under Germany and Switzerland.

The following specification gives the weights and performances of the Italian-built Dornier "Wal" a twin-engined nine-seater flying-boat for passenger service :—

Engines	**2 Hispano-Suiza, 300 h.p.**
Weight empty	**2,850 kgs. (6,270 lbs.).**
Weight loaded	**4,710 kgs. (10,362 lbs.).**
Weight per h.p.	**7.85 kgs. (17.3 lbs.).**
Max. speed	**180 km.h. (112 m.p.h.).**
Cruising speed	**140 km.h. (87 m.p.h.).**
Ceiling	**4,500 ft. (14,700 m.).**
Fuel capacity (cruising)	**6½ hours.**



A Dornier "Wal" built for the Spanish Navy.

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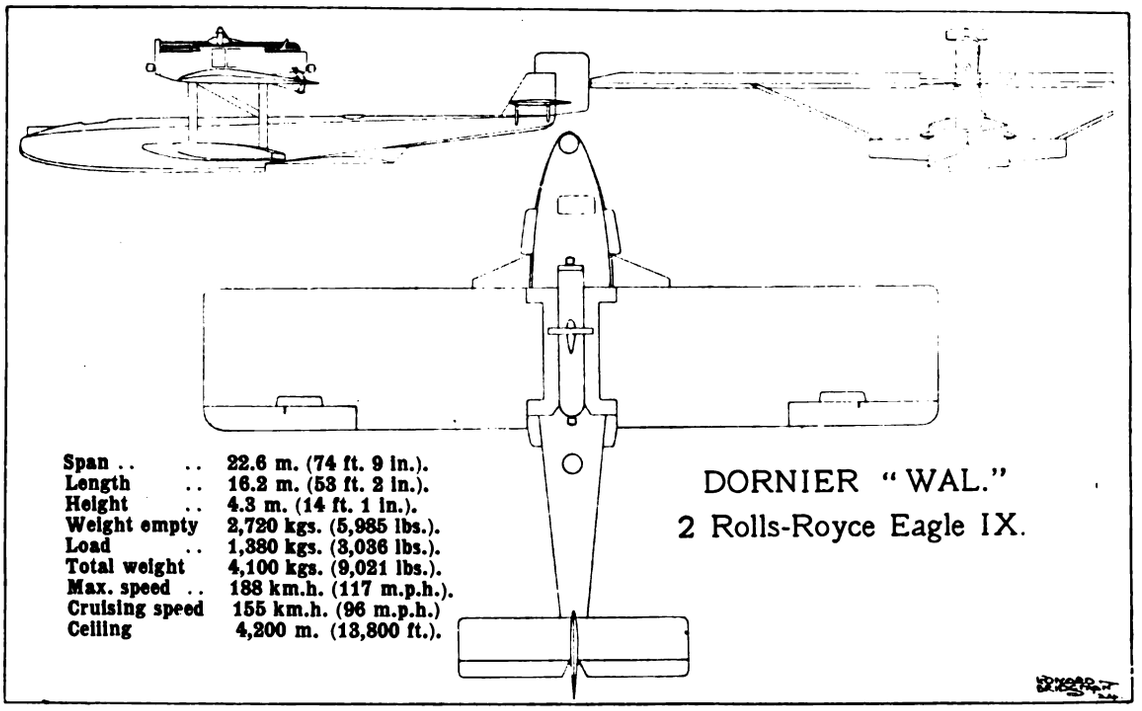
S.C.M.P.—*continued.*


DORNIER "WAL."
2 Rolls-Royce Eagle IX.
Span .. .. 22.6 m. (74 ft. 9 in.).
Length .. 16.2 m. (53 ft. 2 in.).
Height .. 4.3 m. (14 ft. 1 in.).
Weight empty 2,720 kgs. (5,985 lbs.).
Load .. 1,380 kgs. (3,036 lbs.).
Total weight 4,100 kgs. (9,021 lbs.).
Max. speed .. 188 km.h. (117 m.p.h.).
Cruising speed 155 km.h. (96 m.p.h.)
Ceiling 4,200 m. (13,800 ft.).

THE MILITARY "WAL."

This machine, constructed for the Spanish Navy and shown in photographs and a scale drawing, is a modification of the commercial "Wal" type.

This machine is, in fact, a modification of the Dornier "Wal" twin-engine passenger-carrier and except in regard to the absence of the passengers' cabin is practically identical with that machine in general arrangement. The pilot is carried well ahead of the wings, and still further ahead in the bows of the hull is a gunner-observer's cockpit equipped with a "Scarff" gun mounting. A second similar cockpit is placed behind the trailing edge.

A Spanish Dornier "Wal," Italian-built, taking off.

Two Rolls-Royce "Eagle IX" engines are mounted in tandem above the centre section.

The machine is of the standard Dornier construction, with high tensile steel spars and duralumin covering.

The above details of weight and performance are said to be officially verified.

S.I.A.I.

Società Idrovolanti Alta Italia.

Works at Sesto Calende. Offices: 12 via Silvio Pellico, Milan. Flying Water, for testing, etc., at S. Anna, Lago Maggiore. Repair Shops at Castelletto.

Formerly a daughter of the Savoia family, which during the War turned out everything necessary for flying on or in, except engines, this firm is now the concentrated remainder of those extensive businesses.

THE S.23.

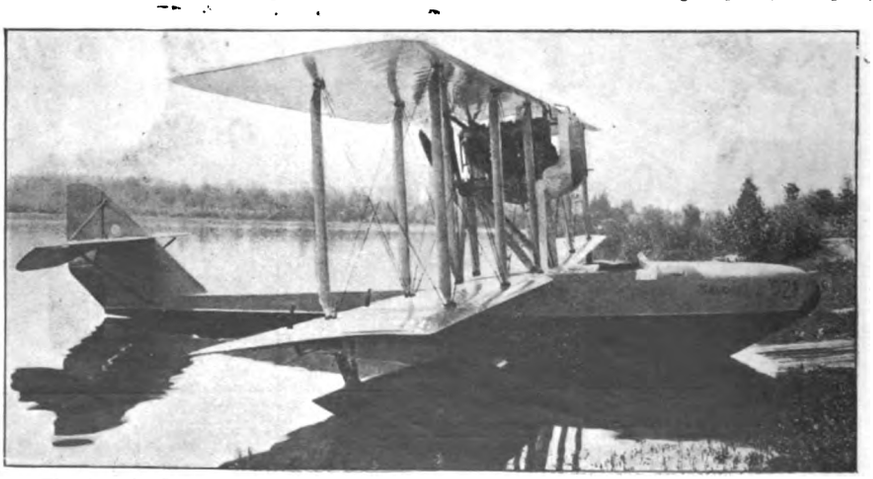
A school flying-boat on standard lines, equipped with dual control, and possessed of a high degree of stability and seaworthiness. It is also fitted for sport and transport flying, in cases where economy is important and speed is not.

THE S.24.

The S.24 is a twin-engined bomber flying-boat fitted with two 300 h.p. Fiat engines mounted in tandem over the hull. A more recent version of this machine is the S.53, illustrated on page 194b. No particulars of the S.53 are available.

Specification of the Savoia 23 Seaplane.

Span	19 m. (62 ft. 3 in.).
Length ..	13.30 m. (43 ft. 7 in.).
Height	4.75 m. (15 ft. 7 in.).
Upper wing chord	2.8 m. (9 ft. 2 in.).
Lower wing chord	2.56 m. (8 ft. 6 in.).
Engines	2 Fiat A 12 bis, 300 h.p. each.
Area	98.75 sq. m. (1,063 sq. ft.).
Weight empty	2,600 kgs. (5,731 lbs.).
Useful load	1,600 kgs. (3,527 lbs.).
Total weight	4,200 kgs. (9,258 lbs.).
Wing loading	43 kgs./sq. m. (8.7 lbs./sq. ft.).
Range (military or civil load) ..	10 hours.
Speed	160 km.p.h. (99 m.p.h.).



The Savoia S.23.

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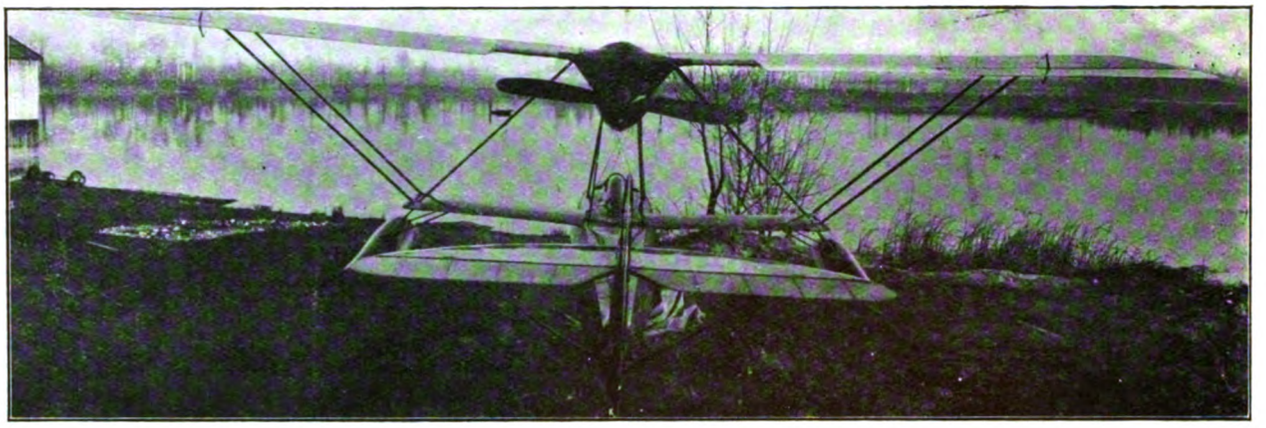
S.I.A.I.—*continued.*



Rear view of the Savoia S.51 (300 h.p. Hispano-Suiza).

THE SAVOIA 51.

The photograph here reproduced shows the Savoia 51, which, flown by Passaleva, finished second in the race for the Schneider Cup, at Naples, in August, 1922.

The machine was built to the design of Ing. Marchetti, late of the Vickers-Terni firm, specially for racing purposes. In the race it was seriously handicapped by the fact that the airscrew unstuck some of its laminations, vibrated horribly and threatened to tear the engine out of the machine. Nevertheless it maintained an average speed of 229 km.h. (141 m.p.hr.).

The main dimensions, etc., are :—

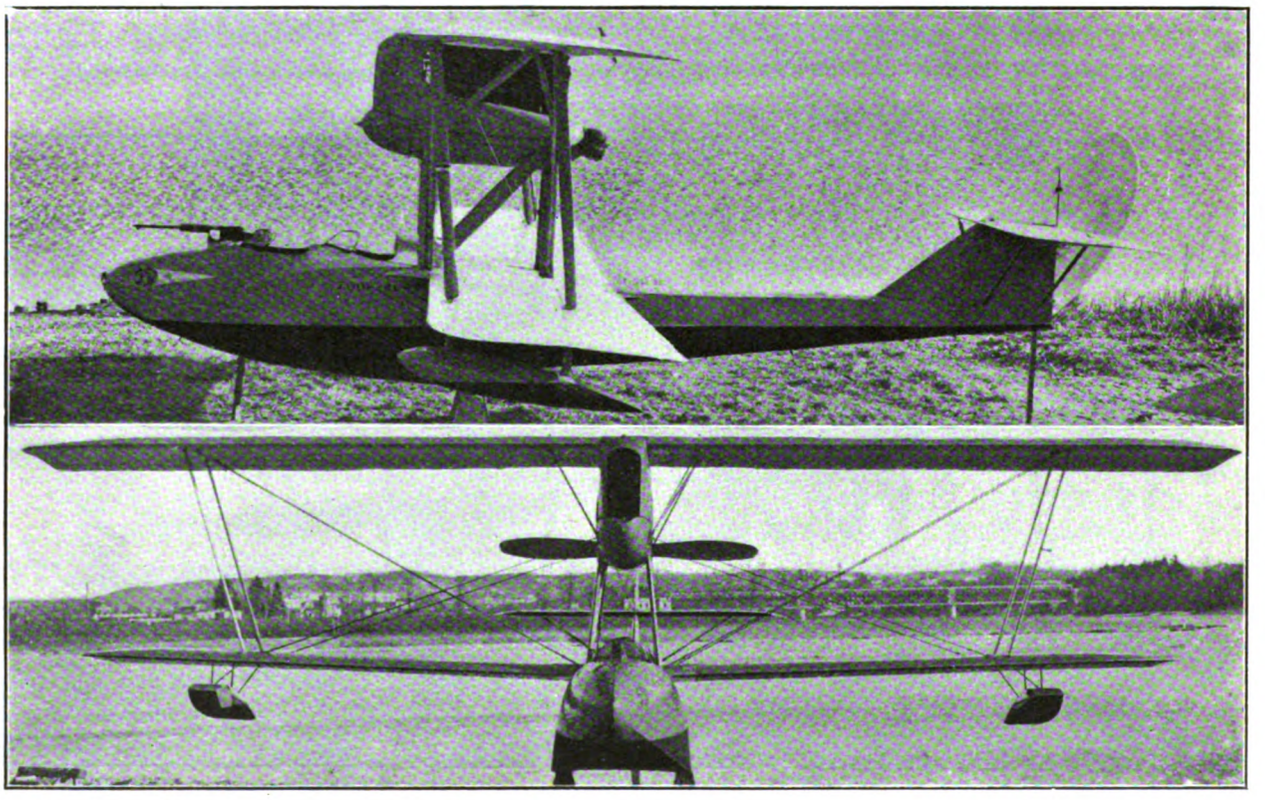
Span, top	**10 m. (32 ft. 9 in.).**
Span, bottom	**4 m. (13 ft. 1 in.).**
Chord, top	**2 m. (6 ft. 7 in.).**
Surface	**23 sq. m. (258 sq. ft.).**
Length	**8 m. (26 ft. 1½ in.).**
Height	**2.5 m. (8 ft. 2½ in.).**
Weight empty	**780 kgs. (1,716 lbs.).**
Fully loaded	**1,080 kgs. (2,376 lbs.).**
Wing loading	**47 kgs./sq m. (9.2 lbs./sq. ft.).**
Engine	**Hispano-Suiza, 300 h.p.**
Power loading	**3.6 kgs./h.p. (8 lbs./h.p.).**

THE SAVOIA 55.

The Savoia 55 is a twin-engine twin-hull monoplane flying-boat built as a high-seas torpedo dropper. The twin hulls, which are of the N.C.4 type, and the thick wing centre section are built in one with the two engines, 300 h.p. Fiats, mounted in a nacelle in tandem and driving a tractor and pusher airscrew over the centre of the wing. The monoplane tail and twin rudders are carried on tail-booms from the keels of the boats and the wing.

Specification.

Span	**24 m. (78 ft. 9 in.).**
Length	**16 m. (52 ft. 6 in.).**
Height	**4.7 m. (15 ft. 10 in.).**
Weight light	**2,980 kgs. (6,560 lbs.).**
Useful load	**1,500 kgs. (3,300 lbs.).**
Weight loaded	**4,480 kgs. (9,860 lbs.).**
Weight per h.p.	**7.2 kgs. (15.8 lbs.).**
Wing loading	**46.7 kgs./sq. m. (9.65 lbs./sq. ft.).**
Max. speed	**160 km.h. (100 m.p.h.).**
Min. speed	**95 km.h. (59 m.p.h.).**
Climb to 2,000 m. (6,560 ft.)	**18 mins.**
Climb to 3,000 m. (9,840 ft.)	**45 mins.**
Range	**3 hours.**



The Savoia S.57 (250 h.p. Isotta Fraschini engine).

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SAVOIA—*continued.*

THE SAVOIA 57.

The Savoia 57 is a single-engined two-seater fighter or reconnaissance flying-boat fitted with the 250 h.p. Isotta Fraschini V.6 engine. The hull is of the characteristic one-step flat-bottomed Savoia type, is built up of three diagonal skins on wood framing and is fitted with a special system of bulkheads to ensure safe landing on and the riding out on moderately heavy seas. The wings are of normal construction, the top being flat and the bottom planes having a dihedral angle. One set of struts are mounted on either side of the engine nacelle. The engine, which is well cowled in, is carried on two N-form struts, the radiator being mounted on the nose of the engine nacelle. The tail unit is quite normal.

The Savoia S.57 (250 h.p. Isotta Fraschini engine).

Specification.

Wing area	**36.5 sq. m. (392 sq. ft.).**
Weight light	**1,100 kgs. (2,420 lbs.).**
Useful load	**500 kgs. (11,000 lbs.).**
Weight per h.p.	**6.4 kgs. (14.1 lbs.).**
Wing loading	**43.5 kgs./sq. m. (9 lbs./sq. ft.).**
Max. speed	**215 km.h. (134 m.p.h.).**
Min. speed	**95 km.h. (59 m.p.h.).**
Climb to 3,000 m. (9,840 ft.)	**19 mins. 30 secs.**
Range	**6 hrs. 20 mins.**

THE SAVOIA 58.

A single-seat fighter flying-boat, fitted with a 300 h.p. Hispano-Suiza. The engine is mounted close under the top plane and the cowling is so arranged that it fairs into the under surface in easy curves. The airscrew is of the pusher type. The two wings are unequal both in span and in chord, the upper being the larger. One single pair of outward-raking interplane struts is fitted on each side. The machine is distinctly like the Savoia 57, from which it has apparently been derived.

S. I. A. M. (Società Industrie Alto Mediterraneo.) Posillipo (Naples). Testing shops at Lucerne. Nom. capital: 10,000,000 lire. Paid up capital: 6,000,000 lire. Managing Director: Dr. Bruno Canzio.

Government contractors. No information as to recent productions has been received.

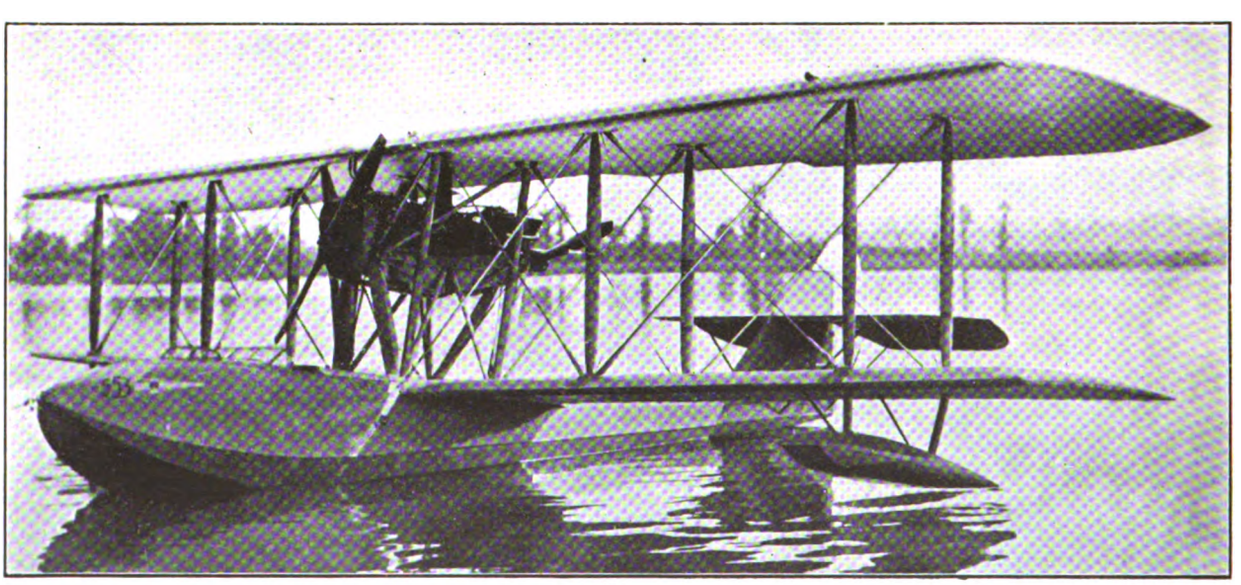
S.V.A.

See *Ansaldo.*

V

VICKERS. (TERNI).

This firm has made some time ago, a very fast small biplane, known as the *M.V.T.* (*Marchetti-Vickers-Terni*), from the names of the designer, makers and place of production. This machine was illustrated and described in the 1920 issue of this Annual No further record of aerial activity has been received.



The Savoia S.53 Twin-engined Flying-boat (2—200 h.p. S.P.A. engines).

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JAPAN.

AICHI ELECTRIC MACHINERY AND WATCH WORKS.

Yobitsuzui-machi, near Nagoya.

This company, manufacturers of electrical machinery and watches, took up the manufacture of seaplanes recently, and has supplied many seaplanes to the Japanese Navy Air Service.

Capt. Umitani, ex-navy air officer, is the director and chief engineer of the Aircraft Department of these Works.

This firm are building F.5 flying-boats.

FUKUNAGA AEROPLANE WORKS.

Kaketsuka, Shidzuoka Prefecture.

Build aeroplanes on a small scale. No details available.

ITOH AEROPLANE WORKS.

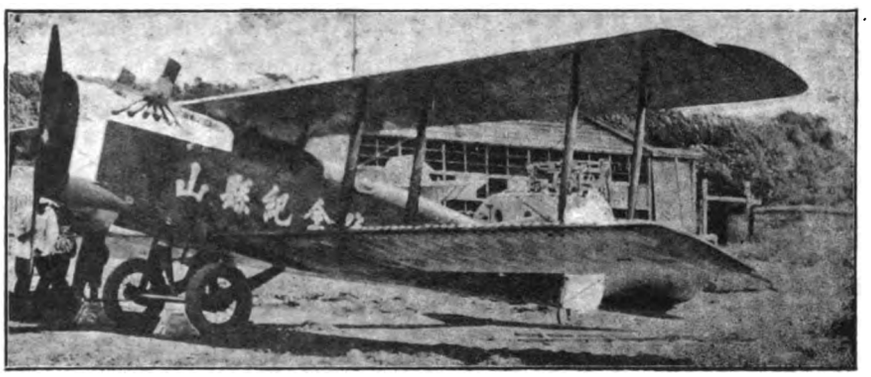
The Itoh Works No. 3 Biplane.

Tsudanuma, Chiba Prefecture.

This firm is the oldest of its kind in Japan, and has built many aeroplanes of several types for civilian aviators. Almost all of the civilian aviators' aeroplanes at present used in Japan were made by this firm.

During last year, built following six types of their own design of machines :—

1. Itoh sporting single-seat tractor biplane, 45 h.p. Itoh engine.
2. Itoh training two-seater dual control tractor biplane, 90 h.p. Curtiss.
3. Akitago, long distance single-seat tractor biplane, 300 h.p. Maybach.
4. Yamagata-Kinen-Go, goods carrier two-seater tractor biplane, 400 h.p. Liberty.
5. Itoh flying-boat, four-seater pusher biplane, commercial type, 180 h.p. Hispano-Suiza.
6. Taihokugo, four-seater tractor biplane, passenger limousine.



The Yamagata-Kinen-Go Two-seater (400 h.p. Liberty).

Specifications of Itoh Aeroplanes.

Machine.	Sport (1)	Training. (2)	Long Distance. (3)	Flying-Boat. (5)
Span	5.800 m.	8.828 m.	10.60 m.	14.66 m.
Length	5.110 m.	6.450 m.	7.712 m.	7.65 m.
Height	2.100 m.	2.560 m.	2.800 m.	3.00 m.
Area	?	23.0 sq. m.	28.8 sq. m.	?
Weight empty ..	205 kgs.	500 kgs.	?	?
Weight loaded ..	300 kgs.	750 kgs.	1,573 kgs.	1,350 kgs.
Motor	Itoh	Curtiss	Maybach	Hispano-Suiza
H.P.	45 h.p.	90 h.p.	300 h.p.	180 h.p.
Speed	129 km.p.h.	140 km.p.h.	180 km.p.h.	120 km.p.h.

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NIPPON SHARYO SEIZO CO., LTD.

Atsuta-Machi, Nagoya.

This firm is a manufacturer of cars. Since 1921 it has been making machines to official specifications, to be supplied to the Army, and is expected to build also to their own design in the future.

OGURI.

2, Nakasarugakucho, Kandaku, Tokio.

Mr. T. K. Oguri, who is one of the very well-known civilian aviators in our country, has built several different types of aeroplanes, among them are Curtiss J.N. Type, 90 h.p. Curtiss motor A.1 biplane are very successful.

The J.N. Curtiss type machine A.1, mentioned above has since been modified to take a 180 h.p. Hispano-Suiza engine.

SHIRATO.

Flying School, Samukawa. Chiba Prefecture.

This school has manufactured for its own uses a series of machines which are illustrated in some attached photographs. No specifications are available.

The following firms, which are not known to have produced actual aeroplanes, are to be considered as part of the Japanese aircraft industry.

KIKYU SEISAKU SHO

(Balloon Manufacturing Works).

Oosaki, near Tokio.

These works are making balloons and kite-balloons only, and has supplied many of the kite-balloons to the Army and Navy Air Services.

MURORAN SEIKO SHO.

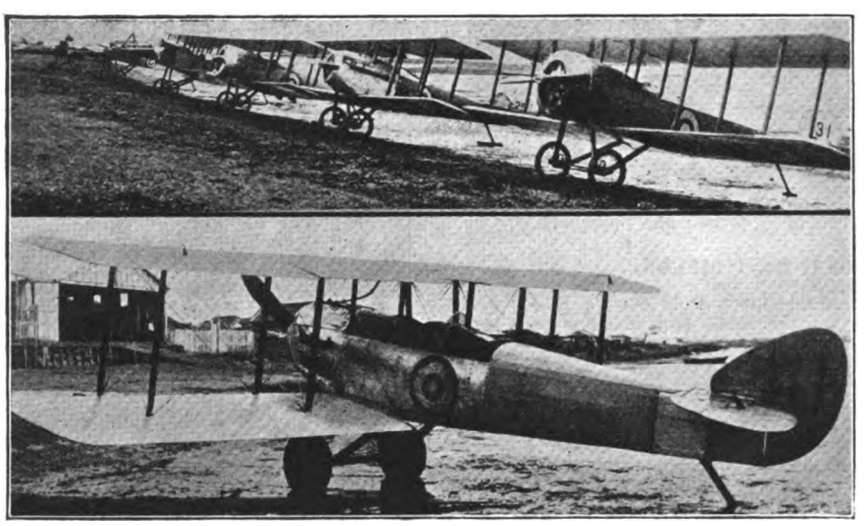
Muroran, Hokkaido.

This is a semi-official iron and steel works. Hence it has undertaken, with conspicuous success, the construction of aero-engines to official specifications and has built a quantity of aero-engines for official requirements.

TOKIO GAS & ELECTRIC ENGINEERING CO., LTD.

Ootemachi, Kojimachi-Ku, Tokio.

This is an engineering firm and a maker of motor-cars. It took up the manufacture of aero-engines some years ago and has succeeded in the construction of aero-engines to Government specifications. Some time ago it obtained from France licence to make Le Rhône engines, and will begin building before long.



The Shirato School Machines. Below, the latest 180 h.p. "Hispano" engined machine.

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LITHUANIA.

DOBKEVICIUS.

Built at Kaunas (Kovno).

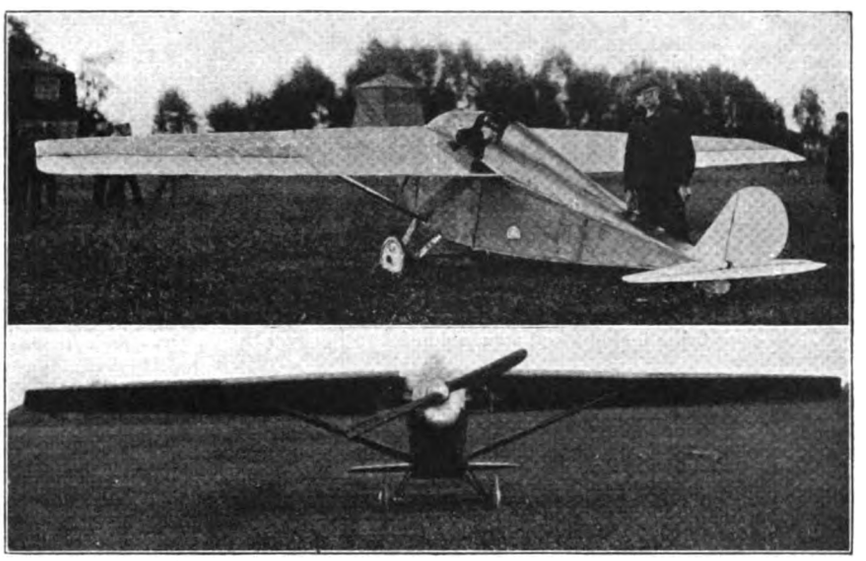
The Dobkevicius monoplane has been designed, built, and flown by a young Lithuanian engineer and has shown itself to possess a really excellent performance. The machine is quite on the small side, having a span of about 25 ft. and a length of approximately 13 ft., but it is very well proportioned and of good aerodynamical form.

The machine proved itself to possess a good all-round performance. It has good stability and quite exceptional manœuvrability, and the fact that it loses its speed very slowly on landing with stopped engine proves that in any case its aerodynamical quality is good. The landing speed is very low.

wing, which is also of all-wood construction, tapers almost to a point from a very wide chord. It is mounted directly on top of the fuselage, the pilot's seat being situated under the wing, access to the cockpit being obtained by means of a folding-panel in the trailing edge of the wing. The observer's seat is in rear of the trailing edge, situated high up so as to give unrestricted vision both above and below the wing. At the base of the fuselage are two small triangular roots rigidly braced to the fuselage. From the tips of these are fitted the rigid wing bracing which consists of two tubes either side, arranged in a narrow Vee. The undercarriage consists of a hump under the fuselage to which are hinged two axles, the outer ends of which are connected to the tips of the two small wing-roots by two

Specification.

Span ..	**..7.9 m. (25 ft. 11 in.).**
Length	**..4.5 m. (14 ft. 9 in.).**
Wing area	**..7.5 sq. m. (80 sq. ft.).**
Weight empty	**167 kgs. (368 lbs.).**
Weight loaded	**295 kgs. (649 lbs.).**
Engine	**..Haacke, 80 h.p. (85 b.h.p. at 1,350 r.p.m.).**
Wing loading	**..39 kgs./sq. m. (8.1 lbs./sq. ft.).**
Power loading	**8.45 kgs./h.p. (18.5 lbs./ h.p.).**
Petrol capacity	**60 litres (13 galls.).**
Oil capacity	**..5 litres (1 gall.).**



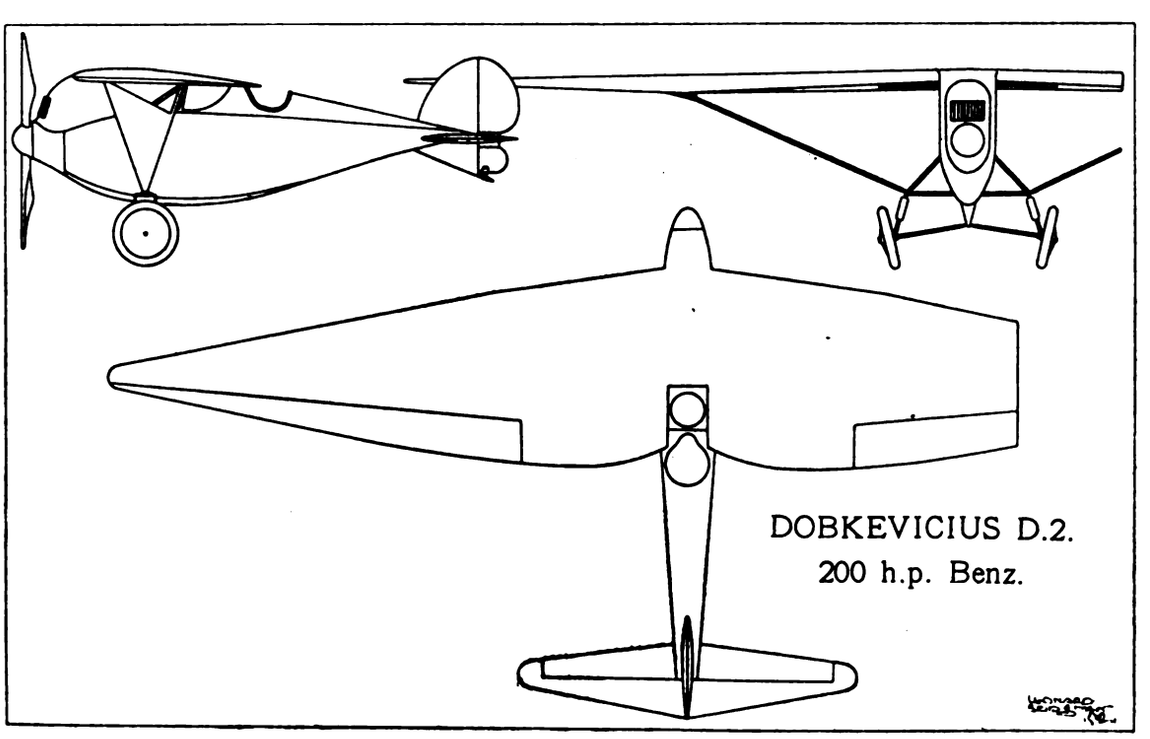
The Dobkevicius Sporting Monoplane.

THE DOBKEVICIUS D.2 MONOPLANE.

The attached photograph shows the latest aeroplane produced by Mr. G. Dobkevicius in Lithuania. It is a military two-seater known as the D.2. and is fitted with a 200 h.p. 6-cylinder Benz engine. The fuselage is of monocoque construction of oval section, being very deep forward and tapering to a point aft. The engine is completely cowled in, the radiators, of M. Dobkevicius' own design, being mounted in the nose. The shock-absorber legs. The arrangement is clearly shown in the photograph above.

In October, 1923, the D.2 was put through a number of performance tests.

In a speed test over a 1 km. course an average speed of 248 km. (155 miles) p.h. was made in four runs over the course, two in each direction. A low speed of 85 km. (50.6 miles) p.h., a climb of 7,000 m. in 34 mins. with a ceiling of 9,000 m. were also obtained.



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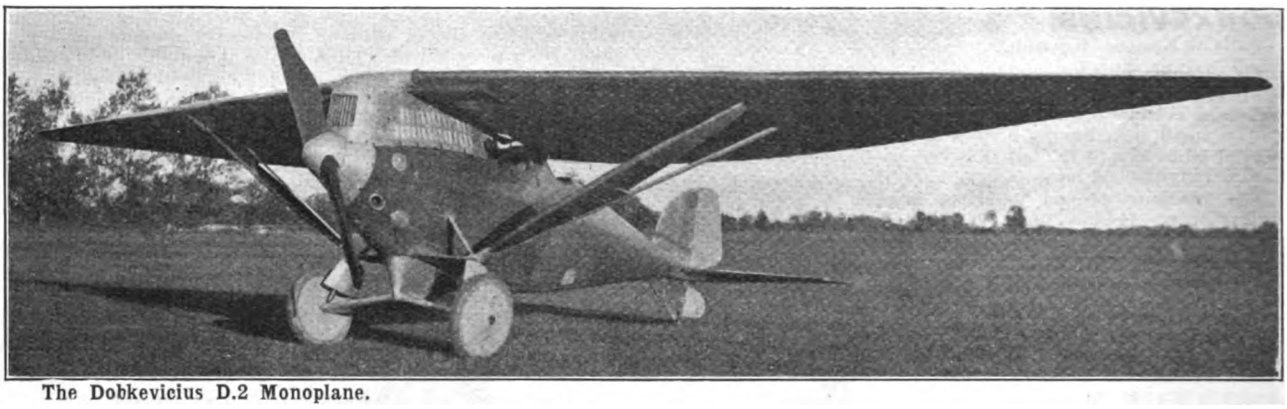
***DOBKEVICIUS**—continued.*



The Dobkevicius D.2 Monoplane.

ROUMANIA.

In the spring of 1923, a Roumanian aeroplane was built at the big railway waggon, carriage and motor works of Astra, at Astra, Transylvania, near the Hungarian frontier. The aeronautical director of these works is Col. Popovici, and the designer M. Ssefsky, who is also Director of Roumanian Civil Aviation.

The machine is a two-seater reconnaissance biplane, fitted with two fixed guns firing forward and a twin gun mounting over the observer's seat.

The engine is a 270 h.p. Benz and two Lamblin radiators are mounted between the legs of the undercarriage.

The wings are of the Spad-Herbemont type.

The following are the chief characteristics :—

Span, top plane	**12.6 m.**
Span, bottom plane	**8.62 m.**
Height	**3.12 m.**
Surface	**36.6 sq. m.**
Weight empty	**1,120 kgs.**
Weight loaded	**1,620 kgs.**
Useful load	**500 kgs.**
Wing loading	**44.26 kgs./sq. m.**
Power loading	**6.5 kgs./h.p.**
Speed, max.	**190 km.h.**
Climb to 3,000 m.	**23 mins. 57 secs.**
Climb to 5,000 m.	**46 mins. 20 secs.**
Ceiling	**5,200 m.**

RUSSIA.

In May, 1922, tests were carried out of a large twin-engine aircraft designed by the "Kommissia pa tiajeloe aviatsia" (Heavier-than-Air Commission), known as the "Komta." This aircraft is a triplane and is very compactly constructed. The wing profile is such that interference is reduced to a minimum, the profile of the top and bottom planes being of the Vickers type and the middle plane that of the Voisin type.

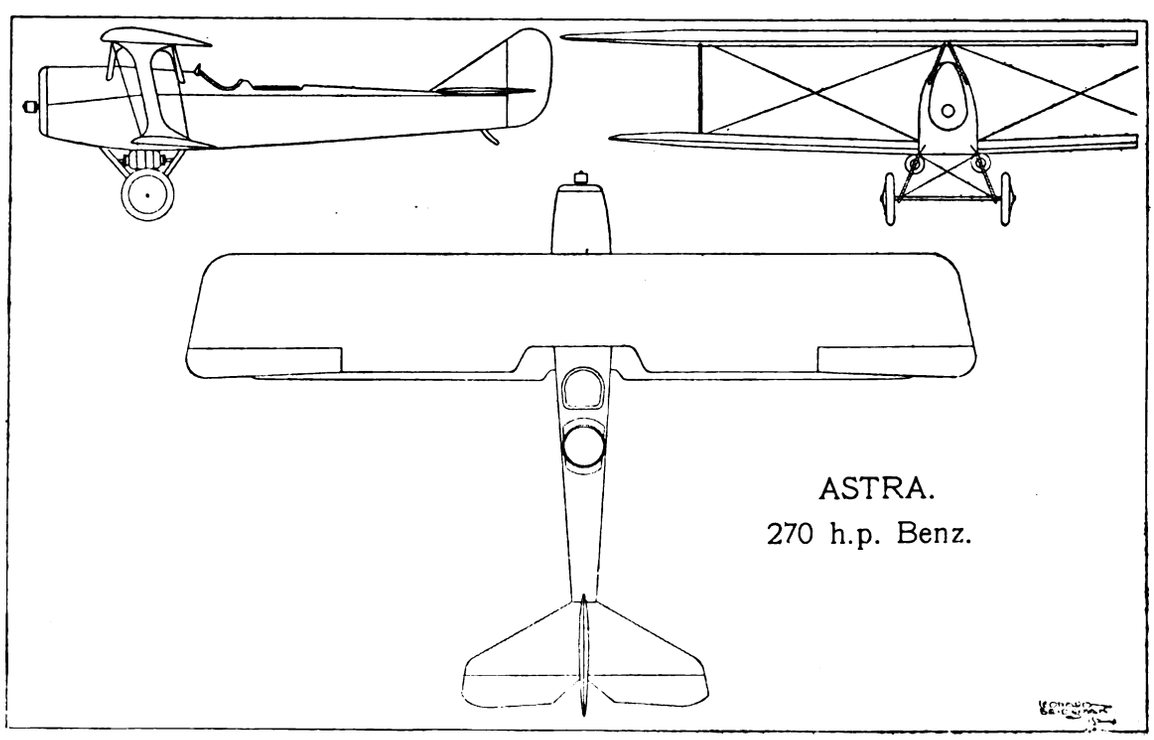
The aircraft was designed in 1920 to be fitted with two 240 h.p. Fiat engines, as there were no other more suitable engines in Russia at that time. The engines are arranged slightly below the centre plane and drive two tractor airscrews.

The aircraft is constructed entirely of wood. It has a biplane tail with two elevators and two rudders. Ailerons are fitted to all three planes.

The following are some of the chief characteristics :—

Total length	**9.8 m. (32.1 ft.).**
Height	**6.1 m. (20.5 ft.).**
Span	**16 m. (52.5 ft.).**
Wing area	**91 sq. m. (969 sq. ft.).**
Weight empty	**2,600 kgs. (5,732 lbs.).**
Load (including fuel for 5 hours' flight)	**1,300 kgs. (2,866 lbs.).**
Wing loading	**28.6 kgs./sq. m. (6.8 lbs./sq. ft.).**
Engine loading	**8.2 kgs./h p. (17.9 lbs./h.p.).**
Estimated speed	**140 km.h. (87 m.p.h.).**
Accommodation	**Closed cabin for 10 assengers.**

[The above information is taken from an Air Ministry Communiqué.—Ed.]



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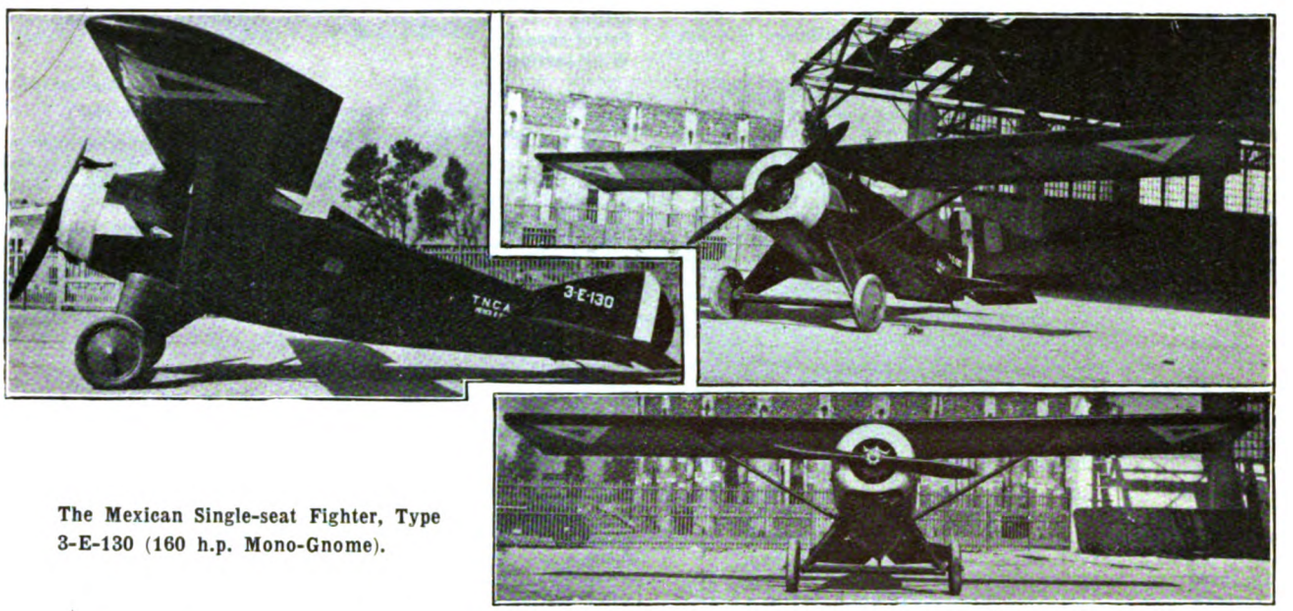
MEXICO.

NATIONAL AIRCRAFT FACTORY.

Valbueno.



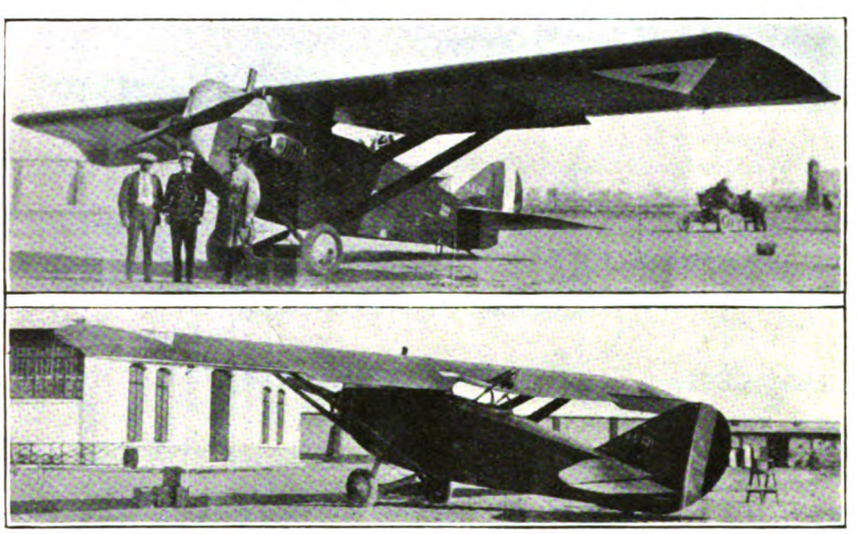
The Mexican Single-seat Fighter, Type 3-E-130 (160 h.p. Mono-Gnome).

Mexico has the distinction of being almost the first country to have employed aeroplanes in actual warfare. In 1915, at the instigation of Major Albert Salinas, the first Mexican military aviator, an aviation department was created and a military aerodrome and flying school was opened at Valbuena, near Mexico City. Owing to the difficulty of obtaining aircraft from Europe at this time and owing to the then strained relations with the United States, it was decided to begin the construction of national aircraft.

This led to the foundation of the National Aircraft Factory at Valbuena, which began work in November, 1915. The factory was very fully equipped with modern machinery and at first a number of Bleriot and Morane-Saulnier monoplanes were built and fitted with such aero-engines as had survived the revolutionary campaigns or could be obtained elsewhere. A number of tractor biplanes were also built, together with a radial engine of the Anzani type known as the "Aztatl," of 80 h.p.

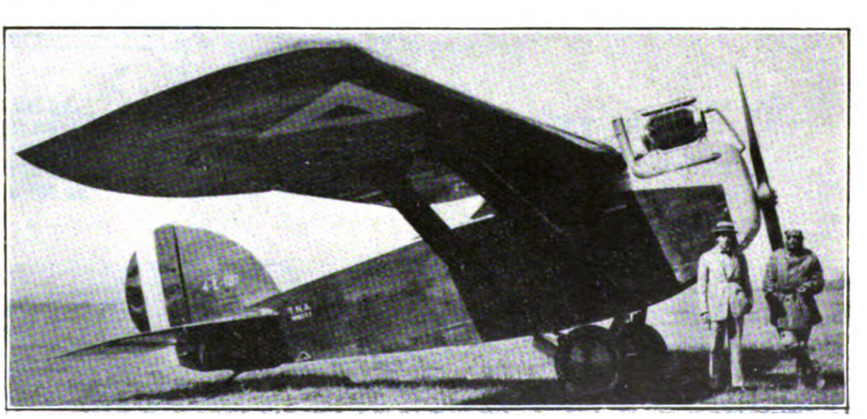
In 1917 an arrangement was made with the Hispano-Suiza Co., of Barcelona, to built their engines under licence.

In 1918 a single-seater scout, known as the Microplano and fitted with a 180 h.p. Hispano-Suiza engine, was built to the designs of Senor Santarini and later a two-seater training biplane fitted with the 80 h.p. Aztatl engine was constructed.



The Factory has recently produced three new types. They are all of the semi-rigid monoplane type and are fitted with the 80 h.p. Le Rhône, the 160 h.p. Mono Gnôme and the 185 h.p. B.M.W. engines. All three types embody the same type of construction, and are to the designs of the Director-General of the Aircraft Factory, Sr. Angel de Lascurain y Osio. It is interesting to note that the aerodrome at Valbuena, Mexico City, is 2,240 m. (7,347.0 ft.) above sea level and that the performance of these machines was obtained in test flights from this aerodrome. Most of the skeleton is made of spruce and covered with three-ply veneer.

The wing sections are all of the Jowkowsky type and all material used in the machines, with the exception of the engines, together with all personnel engaged in the design and construction, are of Mexican origin.



The Quetzalcoatl Two-seat Light Bomber and Reconnaissance Machine (185 B.M.W. engine). In the upper photograph is shown the later edition. The lower photograph is the original of the type. The difference is mainly in the use of a single top radiator in the original and two side radiators in the later type.

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NATIONAL AIRCRAFT FACTORY—*continued.*

THE 5-E-132.

The 5-E-132, of which no illustration is available, is a two-seater training monoplane fitted with the 80 h.p. Le Rhône engine, of which the following is the specification :—

Wing area	**26 sq. m. (280 sq. ft.).**
Weight light	**580 kgs. (1,276 lbs.).**
Weight loaded	**800 kgs. (1,760 lbs.).**
Useful load	**140 kgs. (301 lbs.).**
Weight of fuel	**80 kgs. (176 lbs.).**
Max. speed	**120 km.h. (75 m.p.h.).**
Min. speed	**64 km.h. (40 m.p.h.).**
Ceiling	**5,000 m. (16,400 ft.).**
Petrol capacity	**2 hours.**
Wing section	**Prandtl 430.**

THE 3-E-130.

The 3-E-130, shown in the illustrations, is a single-seater scout fitted with a 160 h.p. Mono-Gnôme engine and two Vickers guns.

Specification.

Wing area	**16 sq. m. (170 sq. ft.).**
Weight light	**670 kgs. (1,474 lbs.).**
Weight loaded	**860 kgs. (1,892 lbs.).**
Useful load	**98 kgs. (216 lbs.).**
Weight of fuel	**92 kgs. (202 lbs.).**
Max. speed	**225 km.h. (140 m.p.h.).**
Min. speed	**76 km.h. (47 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**2 mins. 36 secs.**
Ceiling	**6,000 m. (19,700 ft.).**
Petrol capacity	**1½ hours.**
Wing section	**Prandtl 430.**

THE 4-E-131.

The 4-E-131 or Quetzalcoatl is a two-seater light bomber or reconnaissance monoplane fitted with a 185 h.p. B.M.W. engine. This machine, which is also illustrated, is shown with both one and two Lamblin radiators, the latter form with two radiators, one mounted on either side of the fuselage, being the more recent type. This machine carries 250 kgs. of bombs and has been used in the recent rebellion with success. The armament consists of one fixed Vickers gun firing forward and a twin Lewis gun mounting on a Scarff ring over the observer's seat.

Specification.

Wing area	**33 sq. m. (355 sq. ft.).**
Weight light	**1,130 kgs. (2,486 lbs.).**
Weight loaded	**1,750 kgs. (3,850 lbs.).**
Useful load	**390 kgs. (858 lbs.).**
Weight of fuel	**230 kgs. (504 lbs.).**
Max. speed	**200 km.h. (124 m.p.h.).**
Min. speed	**75 km.h. (46 m.p.h.).**
Climb to 1,000 m. (3,280 ft.)	**4 mins.**
Ceiling	**6,500 m. (21,300 ft.).**
Petrol capacity	**5 hours.**
Wing section	**Prandtl 413.**

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SWEDEN.

ARMY AIRCRAFT FACTORY.

Mälmslatt.

THE "TUMMELITEN."

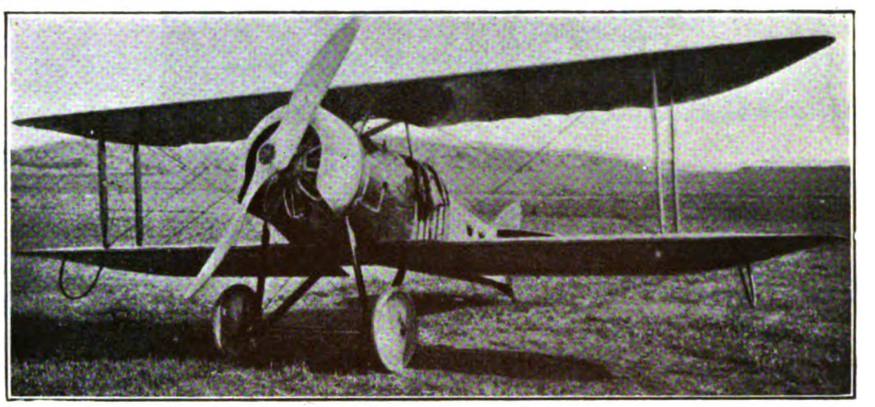
This is a small training biplane resembling a pre-war Bristol "Bullet" fitted with a 90 h.p. Thulin rotary engine.

Performance.

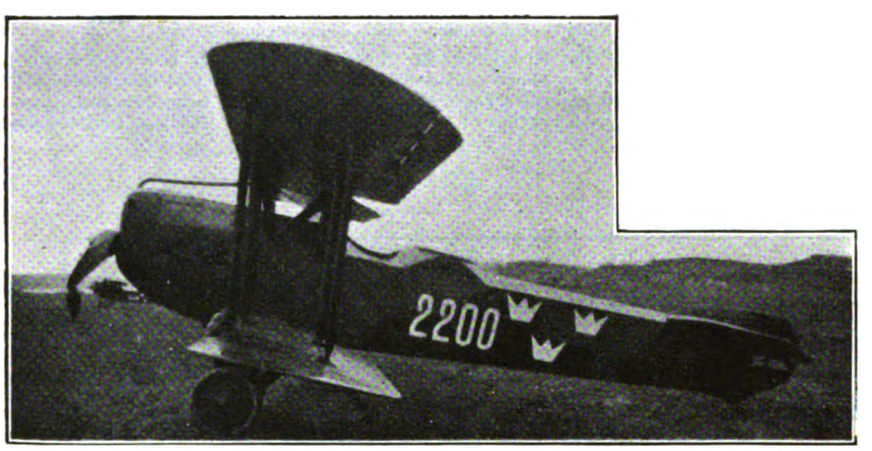
Speed at 1,000 m. ..	**160 km.h.**
Speed at 3,000 m. ..	**155 km.h.**
Ceiling	**5,000 m.**
Weight empty	**380 kgs.**
Weight loaded	**515 kgs.**

TYPE S.21.

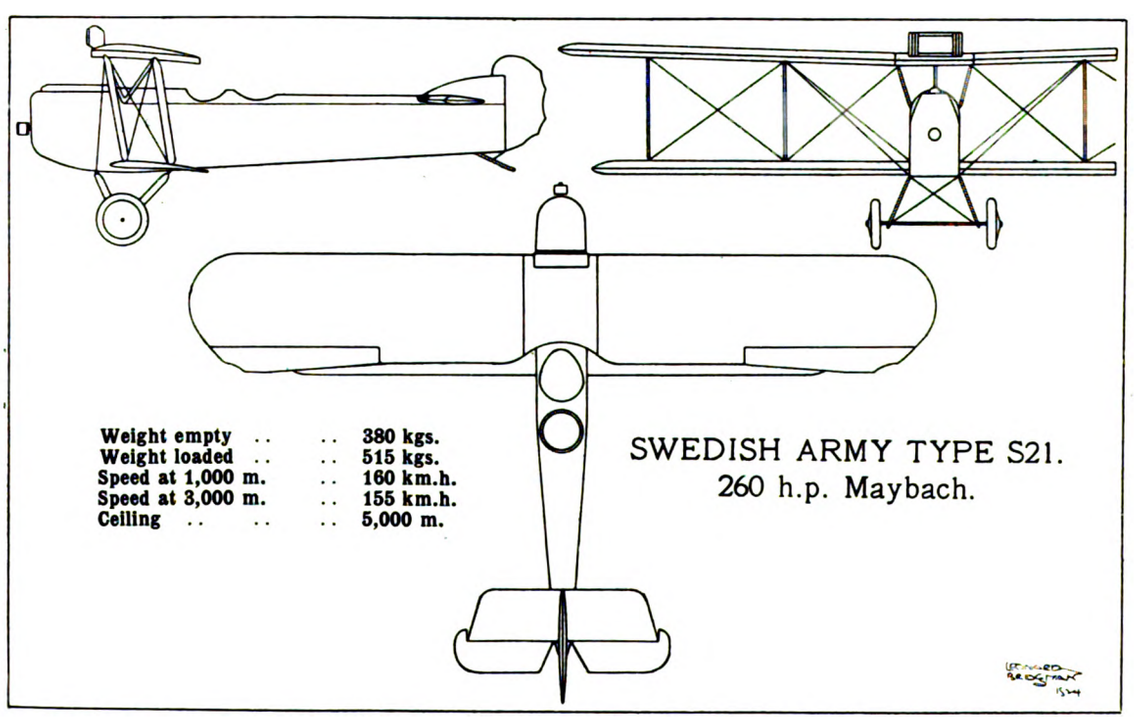
The type S.21 is a two-seater reconnaissance biplane of the Phœnix Brandenburg type of fairly old vintage fitted with a 260 h.p. Maybach engine.



The Swedish Army "Tummeliten" Training Machine.



The S.21 Swedish Army Biplane.


Weight empty .. .. 380 kgs.
Weight loaded .. .. 515 kgs.
Speed at 1,000 m. .. 160 km.h.
Speed at 3,000 m. .. 155 km.h.
Ceiling .. .. .. 5,000 m.
SWEDISH ARMY TYPE S21.
260 h.p. Maybach.

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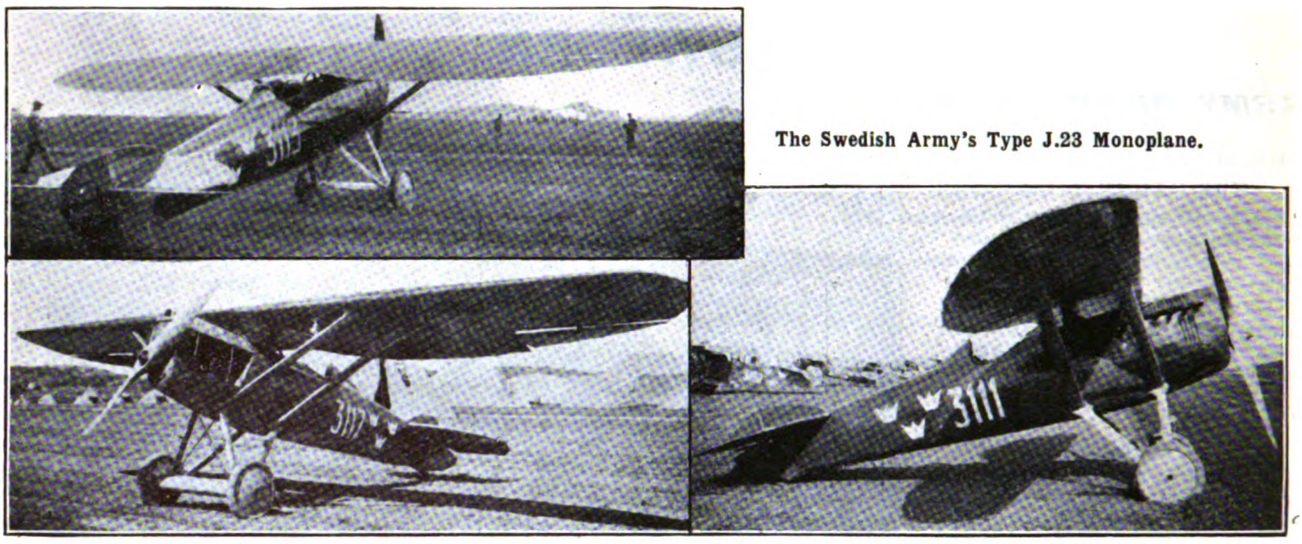
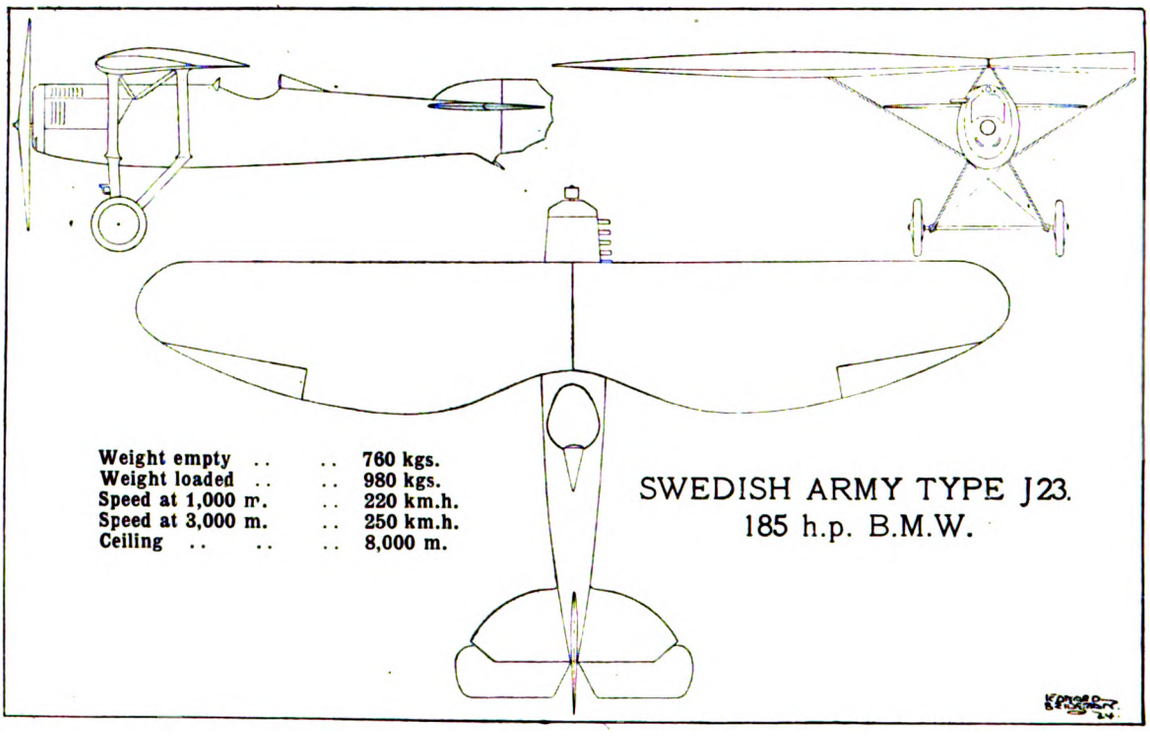


The Swedish Army's Type J.23 Monoplane.

TYPE J.23.

The type J.23 is a new design parasol monoplane of all-wood construction and very well built. The engine is a 185 h.p. B.M.W. It reminds one of a cross between a rigidly braced Morane "Parasol" and Bristol "Bullfinch," its connection with the latter being in the shape of the wings. These are thickest at the point of attachment of the rigid struts and taper both to the tips and centre.

Slotted ailerons are fitted. The fuselage is a monocoque of an egg-shape and deep throughout its length, the rudder being hinged direct on the knife-edge, there being no fin. But a small portion of the rudder is above the fuselage and elevator.


Weight empty .. .. 760 kgs.
Weight loaded .. .. 980 kgs.
Speed at 1,000 m. .. 220 km.h.
Speed at 3,000 m. .. 250 km.h.
Ceiling .. .. .. 8,000 m.
SWEDISH ARMY TYPE J23.
185 h.p. B.M.W.

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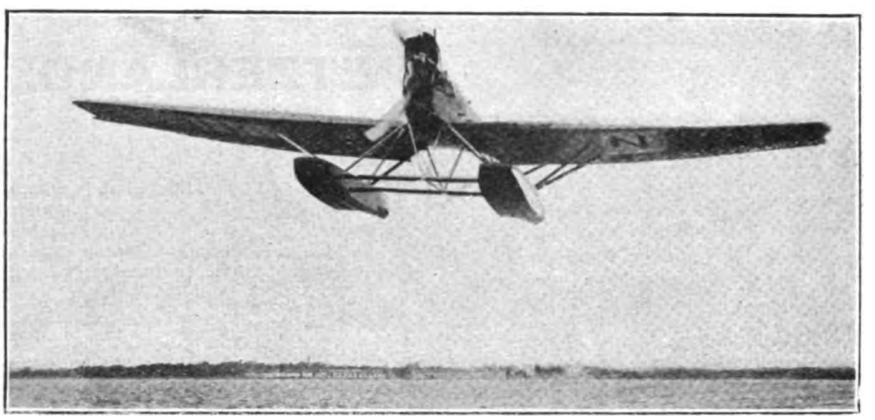
SVENSKA.



The S.1 Seaplane (240 h.p. Maybach engine).

Svenska Aero A. B. Lidingön, Stockholm.

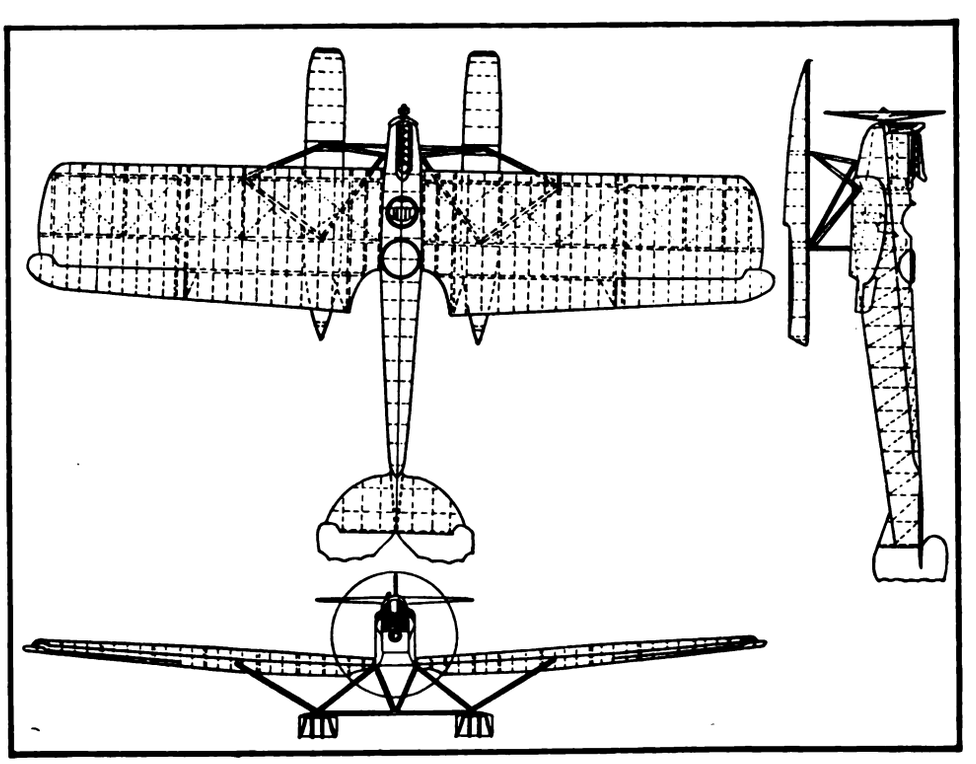
This firm is building, to the designs of Herr Heinkel, a monoplane seaplane known as the S.1 and a number are being built for the Swedish Navy.

The machine resembles the Hansa Brandenburg sea-monoplane of 1918 design, and is a monoplane with the wing placed on the bottom line of the fuselage, and the first model is fitted with a 240 h.p. Maybach 4a.

Subsequent models, including those being built for the Swedish Navy will have 240 h.p. Siddeley "Puma" engines, which engines, being lighter than the Maybach, will permit of an increase in the useful load carried by 200 kgs., and one model has been built fitted with the Rolls-Royce "Eagle IX" engine.

Specification.

Span	**17.5 m. (57 ft. 5 in.).**
Length	**12.65 m. (41 ft. 6 in.).**
Surface	**52.5 m². (565 sq. ft.).**
Weight empty	**1,550 kgs. (3,410 lbs.).**
Useful load	**850 kgs. (1,870 lbs.).**
Weight of fuel	**200 kgs. (440 lbs.).**
Total weight	**2,600 kgs. (5,720 lbs.).**
Wing loading	**50 kgs./m². (10.1 lbs./sq. ft.).**
Power loading	**10 kgs./h.p. (22 lbs./h.p.).**
Speed	**165 km.p.h. (102 m.p.h.).**
Climb	**1,000 m. (3,280 ft.) in 7 mins.**
Ceiling	**5,500 m. (18,000 ft.).**



The Svenska S.1 (240 h.p. Maybach engine).

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SWITZERLAND.

THE FEDERAL CONSTRUCTION WORKS.

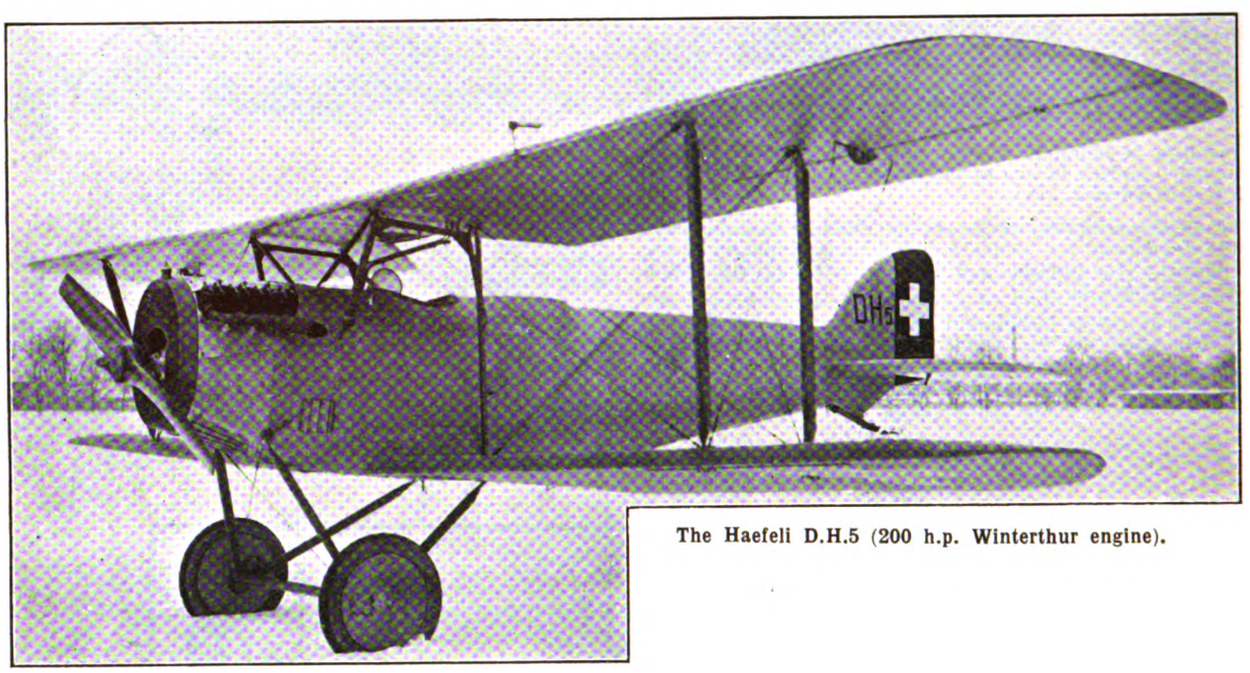
Thoune.

Engineer : A. Haefeli.

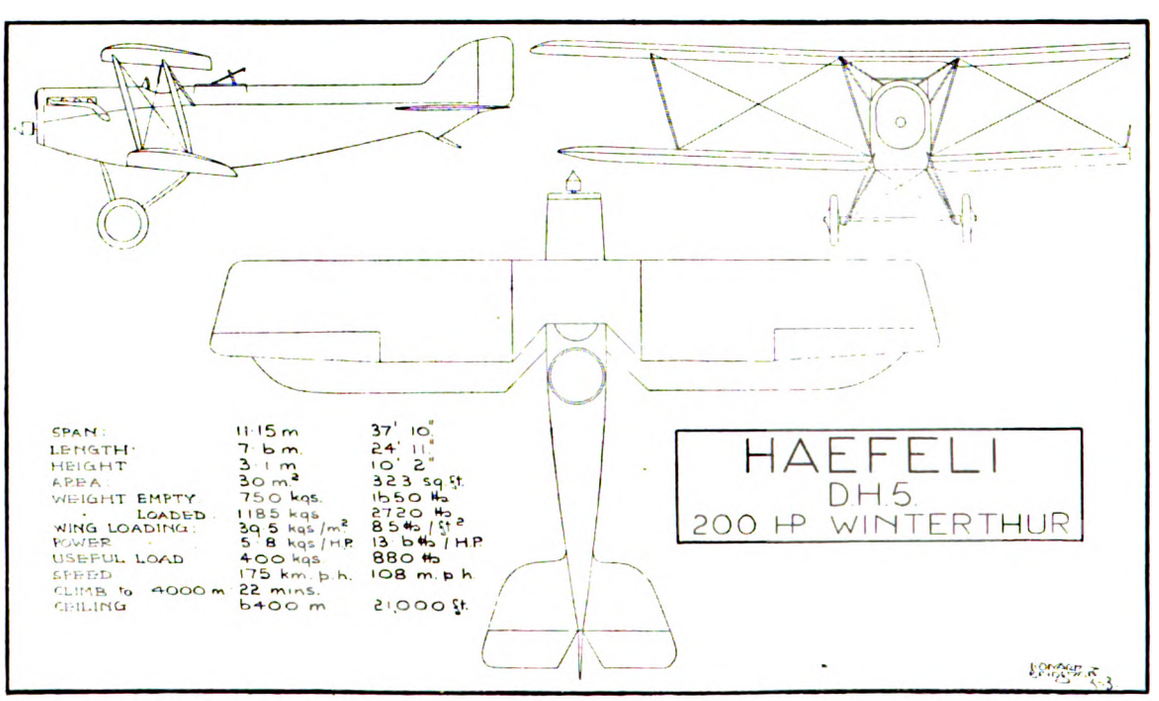
An official Government establishment.

THE DH.5 TWO-SEATER RECONNAISSANCE BIPLANE.

The D.H.5 appears to be the standard type in the service of the Swiss army, and as may be seen from the photograph and scale drawing attached is quite a normal but useful machine of the two-seater general service type. The machine has been freely described in earlier volumes.



The Haefeli D.H.5 (200 h.p. Winterthur engine).


SPAN: 11·15 m 37' 10"
LENGTH: 7·6 m. 24' 11"
HEIGHT 3·1 m 10' 2"
AREA 30 m² 323 sq ft
WEIGHT EMPTY 750 kgs. 1650 lbs
LOADED 1185 kgs 2720 lbs
WING LOADING: 39·5 kgs/m² 8·5 lbs/ft²
POWER 5·8 kgs/H.P. 13 lbs/H.P.
USEFUL LOAD 400 kgs 880 lbs
SPEED 175 km. p.h. 108 m.p.h.
CLIMB to 4000 m 22 mins.
CEILING 6400 m 21,000 ft.
HAEFELI
DH.5.
200 HP WINTERTHUR

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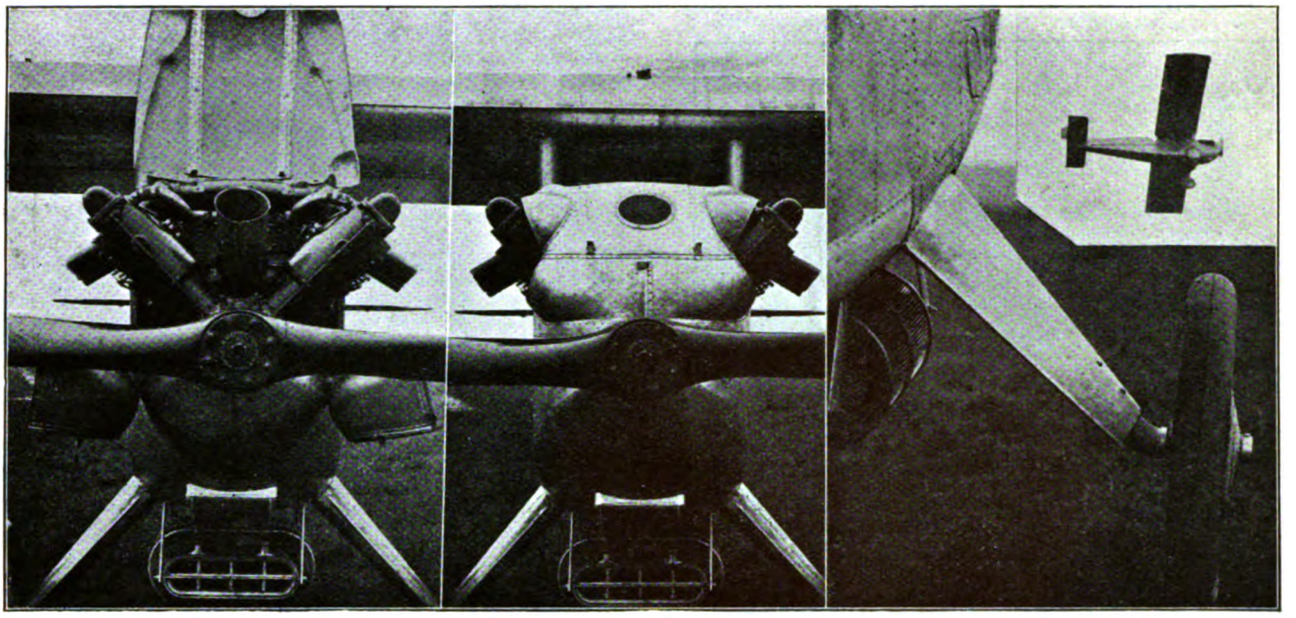
DORNIER.



The Dornier "Falke."—On left, view of nose with engine cowling open. Centre, a similar view with cowling in place. Right, the cantilever undercarriage. Inset, the machine in the air.

THE DORNIER "FALKE" FIGHTER.

The Swiss factory at Romanshorn which now builds Dornier aircraft under licence have recently produced a single-seat fighter to Herr Dornier's design. This machine, known as the "Falke," is a development of the Dornier D.1, which was the first cantilever machine to be built with wings covered with uncorrugated duralumin sheet.

The objects in view in the design of the "Falke" were the best possible fighting view for the pilot, short overall length, and a robust and simple undercarriage. The machine is a cantilever monoplane, of combined steel and duralumin construction, fitted with the 340 h.p. Wright (Hispano type) engine, and equipped with two machine guns.

The wing is carried above the fuselage on four vertical struts. The pilot sits behind the trailing edge of the wing, and his seat can be varied in height so that he may see either above or below the wing.

The wing is in one piece, built on steel spars, duralumin covered, and is of generally similar construction to that of the Dornier "Komet." If it is desired to secure the minimum total weight, the wing behind the rear spar may be fabric covered.

This wing is of a thick section and like the whole design has been developed as the result of extensive aerodynamic tests.

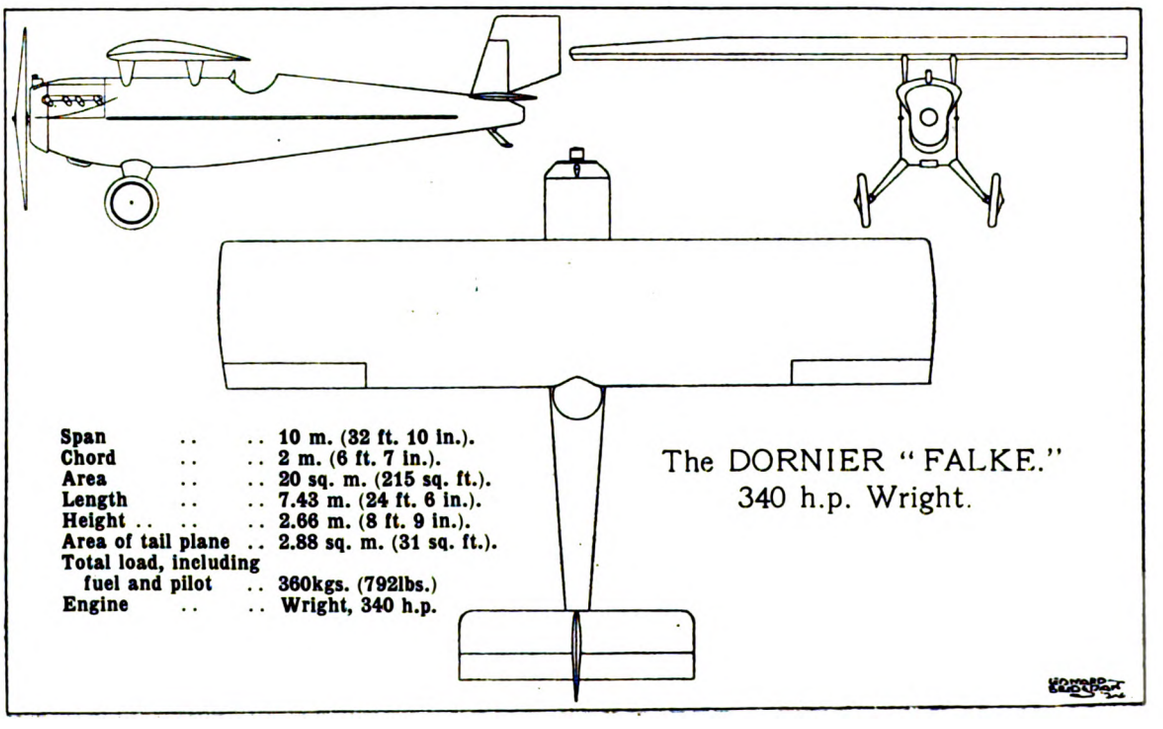
The fuselage is entirely of duralumin and is built up of plain sheets riveted to substantial formers. There is no internal cross-bracing of any kind.

The undercarriage is rather unusual. It consists of a pair of steel tube legs, streamlined by duralumin sheet, pivoted at the fuselage and sprung internally. The ends of the tube are bent outwards to form stub axles for the wheels and there is no connection between the two legs. The wheels themselves are built up of duralumin discs riveted to the hub flanges.

Tail plane, elevators, fin and rudder are of composite steel and duralumin construction and are entirely without external bracing.

The engine is very thoroughly cowled in, but the cowling is so arranged that it is instantly swung out of place and gives complete accessibility to the engine. An oil radiator is also fitted.

Two hours' petrol supply is carried in the petrol tank fitted between engine and the pilot's cockpit.


Span .. .. 10 m. (32 ft. 10 in.).
Chord .. .. 2 m. (6 ft. 7 in.).
Area .. .. 20 sq. m. (215 sq. ft.).
Length .. .. 7.43 m. (24 ft. 6 in.).
Height .. .. .. 2.66 m. (8 ft. 9 in.).
Area of tail plane .. 2.88 sq. m. (31 sq. ft.).
Total load, including fuel and pilot .. 360kgs. (792lbs.)
Engine .. .. Wright, 340 h.p.
The DORNIER "FALKE."
340 h.p. Wright.

T2

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DORNIER—*continued.*

The nose of the "Falke" with a new type radiator.

The Dornier "Falke."

The main stress carrying members of the wings, etc., are of chrome-nickel steel with an ultimate strength of 75 kgs. per square millimetre (50 tons sq. in.), and the whole structure is designed to give a load factor of 10 on normal flying load.

The machine is shown in a number of photographs reproduced here. The main dimensions are given in the specification. The performances are those realised on test at Dubendorf aerodrome near Zurich, under the observation of representatives of the F.A.I.

Performance of the Dornier "Falke."

Maximum speed	265 km.h. (162 m.p.h.)
Landing speed	85/90 km.h. (52/56 m.p.h.)
Climb.	
To 1,000 m. (3,280 ft.)	1.8 mins.
To 3,000 m. (9,840 ft.)	6.5 mins.
Ceiling	8,500/9,000 m. (28,000/20,500 ft.)

THE DORNIER "WAL."

The photograph here reproduced represents the latest version of the Dornier twin-engine boat—known as the "Wal" or Whale. The machine is a slightly modified version of the Do. G.s.II design which was described last year. It is arranged normally to carry nine passengers.

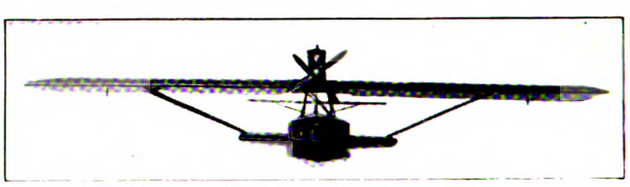
This machine is now built at the Swiss Dornier works at Rorschach. The machine can be built to take a wide variety of engine types—either two B.M.W. 185/230 h.p., two Maybach 260 h.p., two Hispano-Suizas of 300 h.p., or two Napier "Lions" of 450 h.p. placed in tandem.

The main dimensions of the machine are as follows :—

Span	**24.55 m. (80 ft. 6 in.).**
Length overall	**16.15 m. (53 ft.).**
Height overall	**4.35 m. (14 ft. 6 in.).**
Wing area	**93.5 sq. m. (1,005 sq. ft.).**

Weights and performances with various engines are stated to be as follows :—

	B.M.W. 2×180 h.p.	**Maybach. 2×240 h.p.**
Weight empty	**2,700 kgs. (5,940 lbs.).**	**3,085 kgs. (6,800 lbs.).**
Weight loaded	**3,950 kgs. (8,700 lbs.).**	**4,350 kgs. (9,585 lbs.).**
Max. speed	**160 k.p.h. (100 m.p.h.).**	**185 k.p.h. (115 m.p.h.).**
Ceiling	**4,000 m. (13,000 ft.).**	**4,500 m. (14,700 ft.).**
	Hispano 2×300 h.p.	**Napier 2×450 h.p.**
Weight empty	**2,800 kgs. (6,160 lbs.).**	**3,150 kgs. (6,960 lbs.).**
Weight loaded	**4,100 kgs. (9,040 lbs.).**	**4,850 kgs. (10,660 lbs.).**
Max. speed	**180 k.p.h. (112 m.p.h.).**	**200 k.p.h. (124 m.p.h.).**
Ceiling	**4,000 m. (13,000 ft.).**	**5,300 m. (17,500 ft.).**



The Swiss-built Dornier "Wal" nine-seater flying-boat.

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U. S. A.

U.S. ARMY.

The Engineering Division, with headquarters at McCook Field, Dayton, Ohio, is the branch of the U.S. Army Air Service charged with experimentation, development work and the drawing up of specifications for military aircraft.

The Army Air Service recognizes five main classes of military aeroplanes :—I. Pursuit (Fighting) Aeroplanes. II. Attack Aeroplanes. III. Observation (Reconnaissance) Aeroplanes. IV. Bombardment Aeroplanes. V. Training Aeroplanes. These five classes are subdivided into a number of types, as shown below.

Type I. Pursuit Aeroplanes with water-cooled engines (PW) Service equipment is represented by the Thomas-Morse MB-3 and the Boeing MB-3A machines, with 300 h.p. Wright engines. Experimental machines of Type I include the Eng. Div. PW-1 with 350 h.p. Packard Model 1237 engine, welded steel tube fuselage, steel tail surfaces, wood wings, tunnel type radiator under the engine, R.A.F.-15 wing section ; the Loening PW-2A (300 h.p. Wright Model H) and PW-2B (350 h.p. Packard Model 1237) rigidly braced monoplanes of conventional design ; the Orenco PW-3 (300 h.p. Wright) externally braced biplane ; the Gallaudet PW-4 (350 h.p. Packard) internally braced biplane of composite steel and duralumin construction ; and the Boeing PW-5 (350 h.p. Packard).

Type II. Night Pursuit Aeroplanes, Single-Seaters. (NP.) No service equipment available. Contract for experimental equipment, involving Curtiss PN-1 (220 h.p. " Liberty ") steel fuselage cantilever biplane, was cancelled.

Type III. Single-seater Pursuit Aeroplanes with air-cooled engine. (PA.) No service equipment available. Experimental equipment comprises Loening PA-1, designed for 350 h.p. Wright radial engine, development of which was discontinued.

Type IV. Armoured Single-seaters for Ground Attack, water or air-cooled engines. (PG.) No service equipment available. Experimental equipment includes the PG-1 (300 h.p. Wright " Cannon " engine), designed by the Engineering Division and built by the Boeing Co., a sesquiplane in which the power plant, cockpits and fuel tanks are completely armoured ; and the Fokker V-40 (400 h.p. " Liberty ") cantilever monoplane with welded steel fuselage and veneer wings. The armour is removable.

Type V. Two-seater Pursuit Aeroplanes, water or air-cooled engines. (TP.) No service equipment available. Experimental equipment is represented by the Eng. Div. TP-1 (Supercharged " Liberty ") externally braced biplane, with welded steel fuselage, narrow top and wide bottom wings. The Lepère biplane, with supercharged " Liberty " engine, on which Maj. R. W. Schroeder and Lieut. J. A. Macready established several world's altitude records, belongs to Type V.

Type VI. Armoured Three-seaters for Ground Attack. (GA.) Service equipment is represented by the Eng. Div. GA-1 (two 400 h.p. " Liberty ") triplane. Experimental equipment involves the Boeing GA-2 externally braced biplane, designed for the 700 h.p. Model W engine built by the Engineering Division.

Type VII. Infantry Liaison (Contact Patrol) Aeroplanes (IL.) No service equipment. Experimental equipment represented by the Orenco IL-1 with 400 h.p. " Liberty."

Type VIII. Night Observation Two-seaters. (NO.) No special service equipment available, but Type X, with night flying equipment, is used instead.

Type IX. Army Observation Three-seaters. (AO.) No equipment available.

Type X. Corps Observation Two-seaters. (CO.) Service equipment represented by " Liberty "-engined DH-4B (1920-21), DH-4B2 (1921-22) and DH-4M (1922-23), the latter with a welded steel tube fuselage built by the Boeing Co. Experimental equipment comprises the Eng. Div. CO-1 (400 h.p. " Liberty ") cantilever monoplane with composite steel and duralumin construction ; the Eng. Div. CO-2 (400 h.p.) externally braced biplane with bolted steel fuselage and conventional wings ; the Eng. Div. CO-3 ; the Fokker CO-4 (400 h.p. " Liberty ") ; and the Eng. Div. CO-5 (400 h.p. " Liberty ") internally braced biplane with N struts and welded steel tube fuselage. The CO-5 has a total wing area of 375 sq. ft., a gross weight of 4,200 lbs. and a full speed of 132 m.p.h.

The XB-1A, an Americanized version of the Bristol Fighter, built by the Engineering Division, and the Eng. Div. DH-4BW, both with 300 h.p. Wright " H " engine, represent obsolete equipment of Type X.

Type XI. Two-seater Day Bombers. (DB.) Service equipment is represented by the Eng. Div. USD-9A, a close revision of the British DH-9A. Experimental equipment is represented by the Gallaudet DB-1 (700 h.p. Model "W-1A " engine) internally braced all-metal monoplane.

Type XII. Multi-seater Night Bombers for Short Distance. (NB-S.) Service equipment comprises the Martin MB-2, built by the Glenn L. Martin Co., and the NBS-1, built under contract by the Aeromarine, Curtiss and L.W.F. companies. The NBS-1 are modified MB-2's. Both types mount two 400 h.p. " Liberty" engines.

The Engineering Division has redesigned an MB-2 by substituting 300 h.p. Wright " H " engines in the wing nacelles, mounting a " Liberty " in the nose of the machine, and seating the pilot aft of the wings. This aeroplane is assigned to photographic reconnaissance.

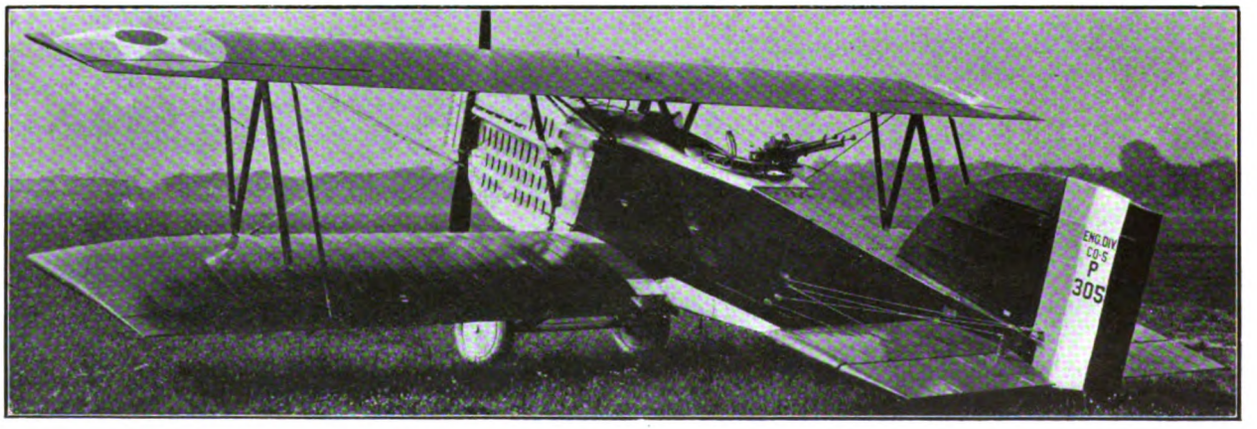
Type XIII. Multi-seater Night Bombers for Long Distance. (NBL.) No service equipment. Experimental equipment comprises the Barling NBL-1, an externally braced triplane with six 400 h.p. " Liberty " engines, which was built by the Witteman Aircraft Corporation. (See under Barling.)

Type XIV. Two-seater Training Aeroplanes, with radial or rotary air-cooled engines. (TA.) Service equipment not available. Experimental equipment comprises the Elias TA-1 (140 h.p. Wright), the Huff-Daland TA-2 (140 h.p. Wright radial or 90 h.p. Curtiss OX-5), the Dayton-Wright TA-3 (80 h.p. Le Rhône) and the Eng. Div. TA-4 internally braced monoplane, now under development.

Type XV. Two-seater Training Aeroplanes, with water-cooled engines. (TW.) Service equipment comprises Curtiss JN-4H (150 h.p. Wright " Model I " engine). Experimental equipment is represented by the Huff-Daland TW-1 (90 h.p. Curtiss " OX-5 "), which is a converted TA-2 ; and the Cox-Klemin TW-2 externally braced biplane, mounting the 180 h.p. Wright " Model E " engine.

Special types for which specifications have been drawn up by the Engineering Division include the " Alert " type single-seater fighter for the defence of service aerodromes from hostile air attack ; and the " Messenger " type single-seater messenger aeroplane. The " Alert " type is represented by the Dayton-Wright PS-1 (Wright-Lawrance " J-1 " 200 h.p. engine), a rigidly braced monoplane with welded steel tube fuselage and retractable undercarriage. The Engineering Division " Messenger," built by the Sperry Aircraft Corporation to official designs, mounts a 60 h.p. Wright-Lawrance 3-cylinder radial engine and is of conventional biplane design.

In March, 1924, the Engineering Division invited American aircraft constructors to submit designs for a Two-seater Corps Observation Aeroplane of original (i.e., not official) design



The American Army Engineering Division C.05 (Corps Observation Machine) (400 h.p. Liberty engine).

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U.S.A.—*continued.*

around any of the following engines :—Wright "T-3," Curtiss "D-12," Packard "1-A-1500" and "Liberty XII." The following performances with full Service load (pilot, observer, fuel and oil for half-an-hour at ground and 3½ hours at 15,000 ft. or 450 miles cruising range, 240 lbs. of armament and 355 lbs. of equipment) were required :—High speed at ground, 150 m.p.h. ; climb to 15,000 ft., 20 mins. ; service ceiling, 21,000 ft. ; landing speed not over 60 m.p.h.

Bids were also called for a Three-seater Light Bombardment Aeroplane (Type XI, modified) to be built around the 650 h.p. Wright "T-3" engine. The following performances with full Service load (crew of three, fuel and oil for half-an-hour at ground level and 5 hours at 10,000 ft., 1,677 lbs. of armament and 380 lbs. of equipment) were required :—High speed at sea level, 115 m.p.h. ; service ceiling, 14,000 ft. ; stalling speed, 55 m.p.h. or less.

The Air Service Engineering Division employs approximately 1,800 hands, and the Fairfield Air Intermediate (Supply) Depot—where a great deal of reconditioning work is being done—about 600.

U.S. NAVY.

The following types of Service equipment are issued to the U.S. Naval Air Service :—

Fighting Plane Squadrons. TS twin-float biplanes with 200 h.p. Wright "Radial" engine. Convertible to land planes.

Observation Plane Squadrons. Glenn Martin MO-1 twin-float monoplanes with 375 h.p. Curtiss "D-12" engines. Convertible to land planes.

Torpedo and Bombing Plane Squadrons. Douglas torpedo plane, twin-float biplanes with 400 h.p. "Liberty" engine. Convertible to land planes.

Scouting Plane Squadrons. F-5L biplane flying-boats with two 400 h.p. "Liberty" engines.

Shipboard Observation Planes. Vought UO-1 twin-float planes with 200 h.p. Wright radial engine. The American Light Cruisers of the "Omaha" class will all carry two such planes on board.

Training Planes. Curtiss N-9 single-float biplanes with 100 h.p. Curtiss "OXX-6" engine. This type is to be replaced by the Boeing Training Plane with 200 h.p. Wright "J-3" or 220 h.p. Wright "E-4" engine, which may be used with twin floats, single float or land type undercarriage.

Eventual Service equipment, which is still in the experimental stage, includes the Curtiss CS-1 plane with the 550 h.p. Wright "T-2" engine and the PN-7 flying-boat with two 550 h.p. Wright "T-2" engines. The SC-1 combines the functions usually performed by three distinct types—bombing, torpedo launching and long distance scouting. The PN-7 is destined to take the place of F-5L type in the Scouting Plane Squadrons.

CONSTRUCTION PROJECTS UNDER WAY.

The following types of aircraft, subdivided according to class designation, are in the course of construction :—

(1) **Class VF, fighting planes.**
- (*a*) CR3, single-seater seaplane. CR2 aeroplanes are being converted into two CR2 seaplanes.
- (*b*) NW2, single-seater seaplane. The NW1 aeroplane is being converted into the NW2 seaplane. The wing structure is being changed to a conventional biplane construction, and wing radiators are being substituted for Lamblin radiators.
- (*c*) R2C1, single-seater land-type aeroplane. A high-speed racing and fighting aeroplane built around a special Curtiss D12 engine and involving improvements and experience gained in the CR series of aeroplanes.
- (*d*) TX1, single-seater land-type aeroplane. A high-speed racing and fighting aeroplane built around the Wright T2 engine. Use has been made of the T2 engine installation in the model NW2, although the general design of this aeroplane is entirely different.
- (*e*) TR3A, single-seater seaplane. This is a modification of the TR3 to obtain a greater high speed. The wing area has been reduced, wing radiators added, and a Wright E4 engine substituted for the E2.
- (*f*) UF1, single-seater convertible biplane type. Construction has been delayed due to changing from the Aeromarine U873 to the Wright-Lawrance J1 air-cooled engine.
- (*g*) F4C1, single-seater land-type aeroplane. This is an all-metal aeroplane, built according to the general design of the model TS, and will furnish valuable comparative data as to costs, weights, performance and maintenance.
- (*h*) HPS1, single-seater convertible aeroplane. A monoplane having internally braced cantilever wings embodying the Handley-Page patented wing device for increasing speed range.

(2) **Class VO, observation planes.**
- (*a*) NO1, three-seater convertible aeroplane. Being built by the Naval Aircraft Factory and the L.W.F. Corp., according to the same general design as the model M2O1.

(3) **Class VS, scouting planes.**
- (*a*) CS1, two-seater convertible aeroplane. A three-purpose aeroplane designed to be converted from a scout to a torpedo plane or bomber. Equipped with standard Wright T2 engine, and, as a seaplane, with twin floats.
- (*b*) CS2, two-seater convertible aeroplanes. Modification of the CS1 for long range scouting duty. A special T2 engine is to be used, fuel and oil capacity greatly increased, and wing radiators used.
- (*c*) CS3, two-seater convertible aeroplane. This aeroplane is the same as the CS2, except that a geared T2 engine is to be installed.

(4) **Class VP, patrol plane.**
- (*a*) PN7, flying-boat. A modification of the F5L and designed to be used either as a patrol plane or as a bomber. By the use of a thick high lift aerofoil, the wing area and the span have been reduced. This allowed a general cleaning up in the design of the wing structure and the elimination of many struts and wires. The new wing structure, together with new engines of greater horsepower, should result in improved performance.

(5) **Class VN, training planes.**
- (*a*) N2N, two-seater seaplane. A training plane of conventional design for instruction in flying and gunnery.
- (*b*) HN2, two-seater convertible aeroplane. A modification of the model HN1 for instruction in flying and gunnery.
- (*c*) TG1 and TG2, two-seater seaplanes. These seaplanes are to be used for instruction in flying and gunnery. The TG2 has the main fuel tanks located in the floats, whereas in the TG1 they are located in the fuselage.

(6) **Class VM, marine expeditionary plane.**
- (*a*) NM1, two-seater convertible aeroplane. An all-metal aeroplane to be used for marine expeditionary operations.

The U.S. Navy's P.N.7 Flying Boat (2 Wright T.III engines.).

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(7) **Class VJ, transportation plane.**

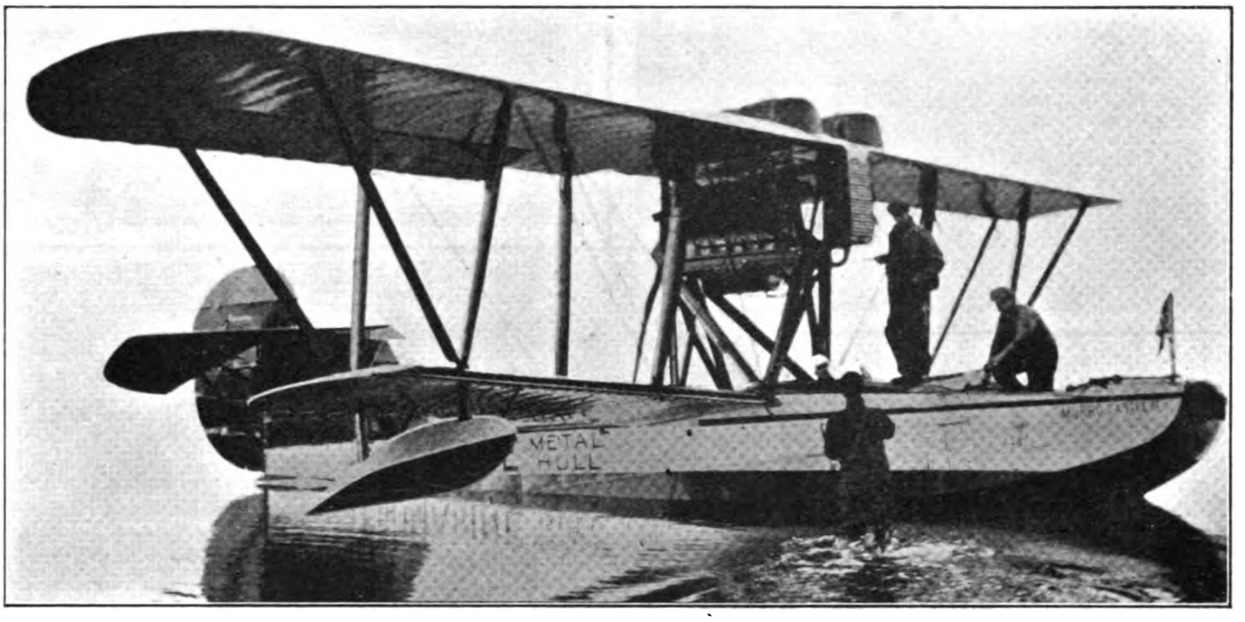
(*a*) Dornier Libelle three-seater boat seaplane. An all-metal boat seaplane which should be interesting in connection with metal construction of hulls.

The Naval Aircraft Factory at Philadelphia is for the U.S. Naval Air Service what McCook Field is for the Army Air Service—that is, the Naval Aircraft Factory is charged with experimentation and development work of Service aircraft. In addition, Naval Aircraft are repaired and reconditioned there as well as at the Repair Depot of the Naval Air Station in Pensacola. Actual construction of aircraft is not done in these establishments, save for experimental purposes, but the "reconditioning" work may at times be very thorough, to the extent of "rebuilding a crashed aircraft out of the salvaged name plate," as one pilot put it.

The Naval Aircraft Factory employs approximately 1,000 hands and the Pensacola Repair Depot about 600.

A

AEROMARINE.



The Aeromarine A.M.C. Metal Hull Flying Boat (400 h.p. Liberty engine.).

The Aeromarine Plane and Motor Co., Key Port, New Jersey.

The Aeromarine Company produced, in 1923, to the designs of its chief aeroplane engineer, Paul G. Zimmerman, two very interesting commercial aeroplanes embodying part metal construction :—the Aeromarine Model A.M.C. flying-boat and the Aeromarine Mail Aeroplane, both equipped with the 400 h.p. "Liberty" engine.

AEROMARINE MODEL A.M.C. FLYING-BOAT.

The Aeromarine A.M.C. commercial flying boat was built with a view to supersede the converted war-time HS-2L "Liberty"-engined flying-boat which the Aeromarine Airways were using on their commercial services. As the wooden hull of the HS-2L has the great drawback of water soakage, which seriously impairs the performance after a prolonged sojourn in the water, it was decided to use an all-metal hull on the new flying-boat. Other requirements were a greater sturdiness of the hull for operating from beaches and a better all-round performance.

Tests were made for two years with various aluminium alloys, and finally the 17-S alloy (copper, 3.5-5.5 ; manganese, 0.5-0.8 ; magnesium, 0.5-0.75 ; iron, 0.67 ; silicon, 0.33 ; aluminium, balance) of the Aluminium Company of America was selected. The metal was used in sheets of sufficient thickness so that the plating of the hull would take the loads imposed on the structure, the frames and longitudinals acting only as stiffeners to carry the load of the skin.

The frame work of the hull consists of eighteen frames, five complete water-tight bulkheads and fore and aft stiffeners on deck and bottom. All the frames and stiffeners are made of the same size of U sections, thickness $\frac{1}{32}$ to $\frac{1}{16}$ in., pressed out of flat sheet with flanges to which the covering was riveted on assembly. Adherence to the same size of section greatly simplified the making of all joints between members, and incidentally saved lots of space in stock room. The bottom members of the frames (floors) are of box section, built up of two webs and channel top, all riveted together.

The covering is of $\frac{1}{64}$ in. thickness on sides and top of hull and of $\frac{1}{16}$ in. thickness on bottom ahead of step. The bottom of the boat is quite smooth and clean, all stiffeners or keelsons being inside where they are protected from damage in handling of boat.

Water-tightness is secured by the use of canton flannel and asphaltum interposed between the thicknesses of metal.

The completed hull is some 100 lbs. lighter than a similar wooden hull, giving accommodation for only four passengers instead of seven in the metal hull.

The hull is wide enough for four persons to sit abreast. The bottom has "V" shape with included angle of 152° at the step, and a still sharper angle toward the bow. The step is 5 in. deep and the bottom back of it rises at the angle of 8° toward the stern, insuring clean running before take-off.

The wing tip pontoons were constructed of sheet 17S alloy, as was also the framework of the tail plane surfaces, which are lighter and very much stiffer than similar surfaces constructed of wood.

The wing structure, which is of conventional wood and fabric construction, is of externally braced biplane form, with the bottom wing having a smaller chord than the top wing. Ailerons are fitted to the top wing only and are counter-balanced by wind vanes.

The power plant, a 400 h.p. "Liberty" engine with pusher airscrew, is mounted on heavy steel tubes, with no cable bracing. The radiator is suspended from the centre wing panel and is only slightly braced to the motor installation, so as to make it free from vibration. The petrol system consists of two 50 gallon tanks mounted in the centre panel above the engine, and of a 70 gallon reserve tank in the hull. Gravity feed is used from the main tanks.

The machine carries seven passengers and fuel for four hours. With five passengers, fuel for seven hours may be carried.

Specification of the Aeromarine A.M.C. Flying-Boat.

Type of machine	**Biplane Flying-Boat.**
Purpose	**Commercial Passenger Carrier.**
Seats	
Span, upper wing	**65 ft. (19.8 m.).**
Span, lower wing	**48 ft. 6½ in. (14.8 m.).**
Length	**32 ft. 10 in. (10.0 m.).**
Chord, upper wing	**7 ft. (2.13 m.).**
Chord, lower wing	**5 ft. 1 in. (1.55 m.).**
Wing area	**652 sq. ft. (61 sq. m.).**
Engine	**400 h.p. "Liberty."**
Weight empty	**3,660 lbs. (1,660 kgs.).**
Weight loaded	**6,100 lbs. (2,770 kgs.).**
Total disposable load	**2,440 lbs. (1,108 kgs.).**
Wing loading	**9.35 lbs./sq. ft. (45.5 kgs./sq. m.).**
Power loading	**15.25 lbs./h.p. (6.9 kgs./h.p.).**

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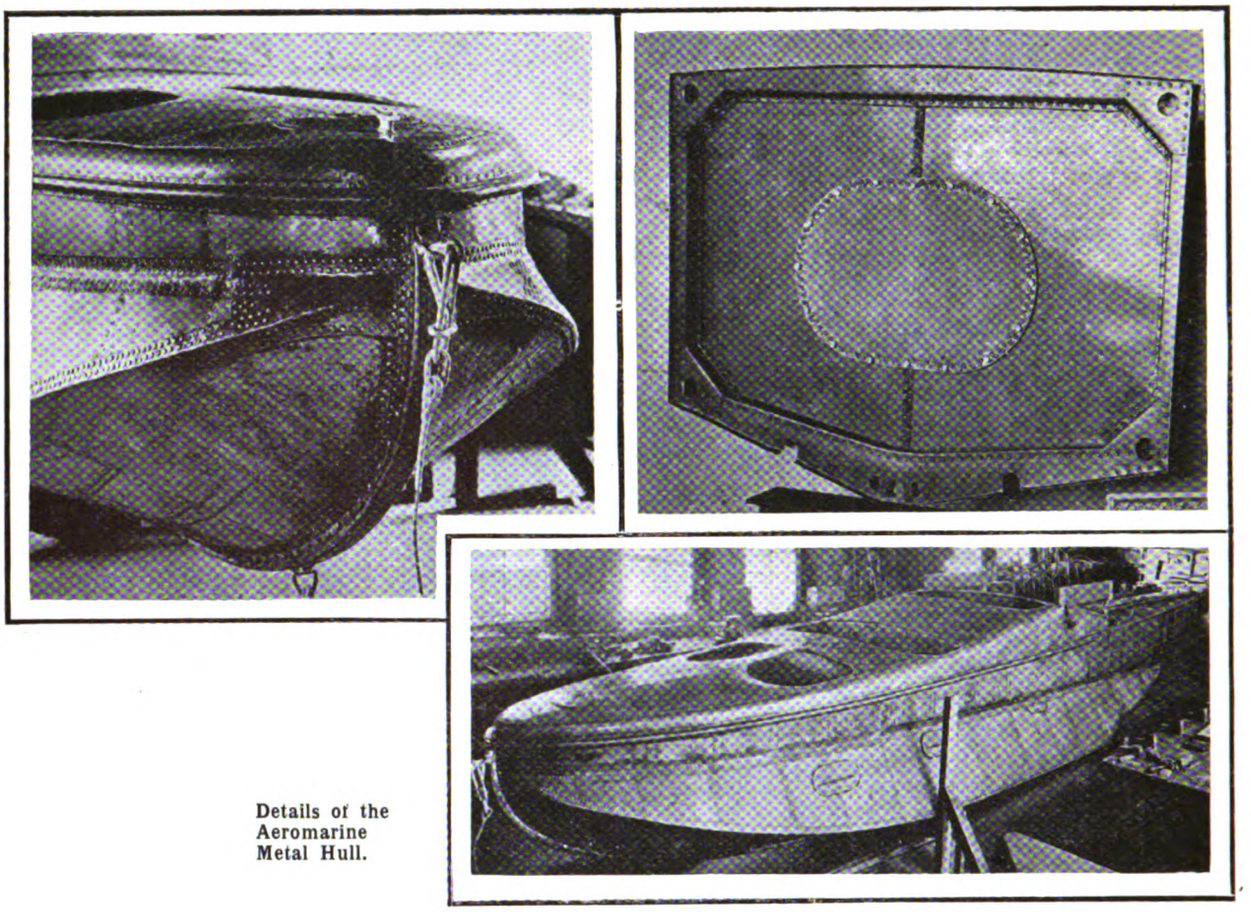
AEROMARINE—*continued.*



Details of the Aeromarine Metal Hull.

Performance.

High speed (1,700 r.p.m.)	..	104.8 m.p.h. (169 km.h.)
Cruising speed (1,400 r.p.m.)	..	80 m.p.h. (129 km.h.).
Min. flying speed (1,150 r.p.m.)	..	60 m.p.h. (97 km.h.).
Ceiling, absolute	..	14,000 ft. (4,280 m.).

Climb.

In 10 minutes	..	3,300 ft. (1,000 m.).

The A.M.C. has been subjected to extensive trials and the results have been entirely satisfactory. No trouble whatever has been experienced from water soakage or leakage, and though there was some difficulty in making the paint stick to the hull, there have been no indications of corrosion, excepting in the case of some 140 rivets out of the 40,000 used. The defaulting rivets were apparently of a different alloy.

After remaining moored in the open, between flights, for two months, the boat was flown by C. J. Zimmerman (brother of the engineer) early in 1924 from Keyport to San Juan, Porto Rico, and there placed in the passenger sightseeing service.

The pilot states in a letter that the boat is standing up wonderfully, although the bottom is pretty well covered with barnacles, which will have to be scraped off as they slow down the take-off. Some 8,000 miles have now been flown by the machine.

AEROMARINE MAIL AEROPLANE.

The Aeromarine Mail Aeroplane, which was produced in the summer of 1923, a few months after the A.M.C. boat, is a two-bay biplane with four ailerons. The span of the top wing is larger than that of the bottom wing. The wings are of conventional wood and fabric construction, while the fuselage and tail surfaces are constructed of 17-S aluminium alloy, much in the manner of the A.M.C. hull.

The fuselage takes a triangular section back of the wings, which results in saving some weight. A plate-girder construction is used with longerons of channel section. Frames and bulkheads are of metal from $\frac{1}{32}$ to $\frac{1}{16}$ in. thick, and the longerons are of $\frac{1}{16}$ in. thickness. The covering is $\frac{1}{32}$ in. thick. There are heavy reinforcements of $\frac{1}{16}$ in. metal at the cockpit openings and similar places.

The design has been planned to use sheets with little or no forming for covering the fuselage, and the beams and struts are built up of sections that are easily formed.

The engine, a 400 h.p. "Liberty," is carried on a mounting of steel tubing with wooden bearers. The oil tank is under the engine and acts also as an oil radiator. The water radiator is carried on the top wing with two brackets. Two petrol tanks of 50 gallon capacity each are also carried on the top wing, giving gravity feed with a 3-4½ ft. head.

The Aeromarine Mail Aeroplane (400 h.p. Liberty engine).

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AEROMARINE—*continued.*

The mail compartment has a capacity of 45 cu. ft. and will carry up to about 1,000 lbs. of mail, although calculations have been made for a normal mail load of 600 lbs. only.

Two machines of this type were built for the U.S. Air Mail Service, and as they are still in the development stage nothing more may as yet be said about them, save that the flying trials were satisfactory, save for minor details, which are now being attended to.

Specification of the Aeromarine Mail Aeroplane.

Type of machine	**Tractor Biplane.**
Purpose	**Mail Carrying.**
Seats	**1.**
Span, upper	**50 ft. (16.4 m.).**
Span, lower	**45 ft. 10 in. (14.0 m.).**
Length	**32 ft. 11 in. (10.0 m.).**
Height	**12 ft. 9 in. (3.58 m.).**
Chord, top wing	**7 ft. (2.14 m.).**
Chord, bottom wing	**5 ft. (1.53 m.).**
Wing area	**540 sq. ft. (50 sq. m.).**
Engine	**400 h.p. "Liberty."**
Weight empty	**2,875 lbs. (1,300 kgs.).**
Weight loaded	**4,450 lbs. (2,020 kgs.).**
Performance.	
High speed	116 m.p.h. (187 km.h.).
Low speed	44 m.p.h. (71 km.h.).
Climb.	
With full load, 6,800 ft. (2,000 m.)	10 mins.
Service ceiling	16,200 ft. (5,000 m.).

The Aeromarine Company has now in hand a small sport type flying-boat with a low-powered radial engine, which has been ordered by an American sportsman. This machine will have a metal hull, similar to that of the A.M.C. type.

The Army Air Service contract for twenty-five Martin Bombers was completed in the winter of 1923-24, and in the spring the firm was practically inactive.

B

BALDWIN.

Baldwin Aircraft Corporation, Baldwin, Long Island, N.Y. President: William F. Bennett. General Manager: J. J. Rooney.

A new firm who have taken over the plant of the late Ordnance Engineering Corporation, who manufactured the Orenco machines. No announcement of policy has as yet been forthcoming from the new owners of the Orenco plant.

BARLING.

The Barling Bomber, the world's largest aeroplane, was produced by the now defunct Witteman Aircraft Corporation, of Hasbrouck Heights, N.J., to the designs of Walter H. Barling, the English aircraft designer. The construction of the machine lasted about two years, and acceptance flights were conducted in autumn, 1923, by Lieut. Harold R. Harris and Lieut. Muir Fairchild, for the Army Air Service. The official designation of the Barling Bomber is NBL-1 (Night Bomber, Long Distance).

The Barling Bomber is a triplane, or rather a 2½ plane, as the middle wing is smaller in span and very much smaller in chord than the top and bottom wings. Only the latter wings carry ailerons. The span is 120 ft. The power plant consists of six 400 h.p. "Liberty" engines, all carried under the middle wing, four of which drive tractor airscrews, and two pusher airscrews.

The basic material is spruce, which is more reliable than other aircraft material. Nearly all of the main fittings are of mild steel. Duralumin is employed for pulley brackets and parts under relatively low stresses.

The fuselage, which is built in sections, is of semi-monocoque type, that is, strengthened by longerons, bulkheads and veneer, as opposed to the simple monocoque type.

The landing gear consists of two "trucks," each of which has two wheels on the front axle and two on the rear axle, all wheels being of the Palmer Aero type with tyre diameters of 60 ins. by 12 ins. Before landing, the pilot pulls a control which lowers the front wheels, causing them to touch first, the energy of landing being absorbed by long-stroke oil cylinders. The reactive force of the ground sets the aeroplane back on the rear wheels and tail skid, on which wheels the subsequent taxiing is done. These rear wheels are sprung by rubber, the endless ring type of absorber being used.

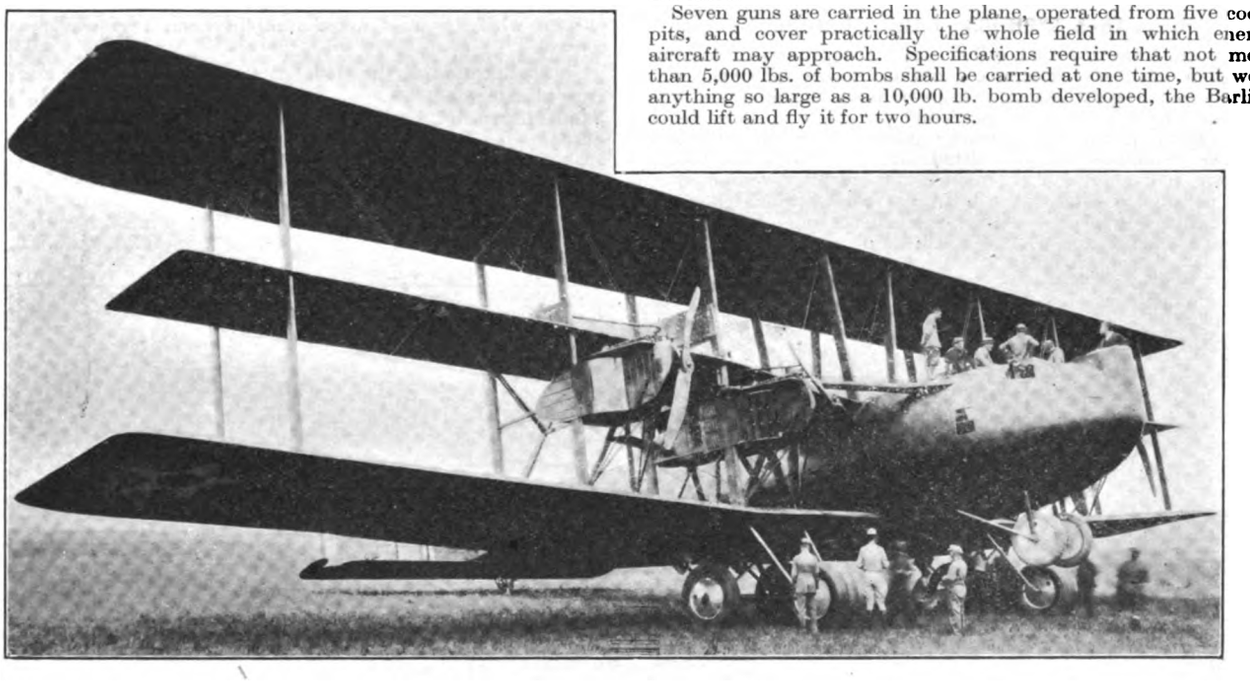
Except for their size, the wings are of conventional wood and fabric construction.

There are four equal size rudders and corresponding fins, the latter forming the interplane struts of the stabilizers. The whole biplane stabilizer is adjustable in incidence in flight from the pilot's cockpit. This feature was an important problem in the design, because of the areas involved, which are :—Stabilizers and elevators, 575 sq. ft.; fins and rudders, 250 sq. ft. With the exception of the ribs and fabric, the tail structure is of metal construction.

There are dual controls for two pilots sitting side-by-side. The loads are large, and frequent change of pilots will be feasible during a long flight.

With the full gasoline capacity of 2,000 galls., the machine is capable of flying for about 12 hours at full speed. With the engines throttled, or some of them shut down completely, the time of flight and the distance covered can be correspondingly increased.

Seven guns are carried in the plane, operated from five cockpits, and cover practically the whole field in which enemy aircraft may approach. Specifications require that not more than 5,000 lbs. of bombs shall be carried at one time, but were anything so large as a 10,000 lb. bomb developed, the Barling could lift and fly it for two hours.



The Barling N.B.L.-1 (6—400 h.p. "Liberty" engines).

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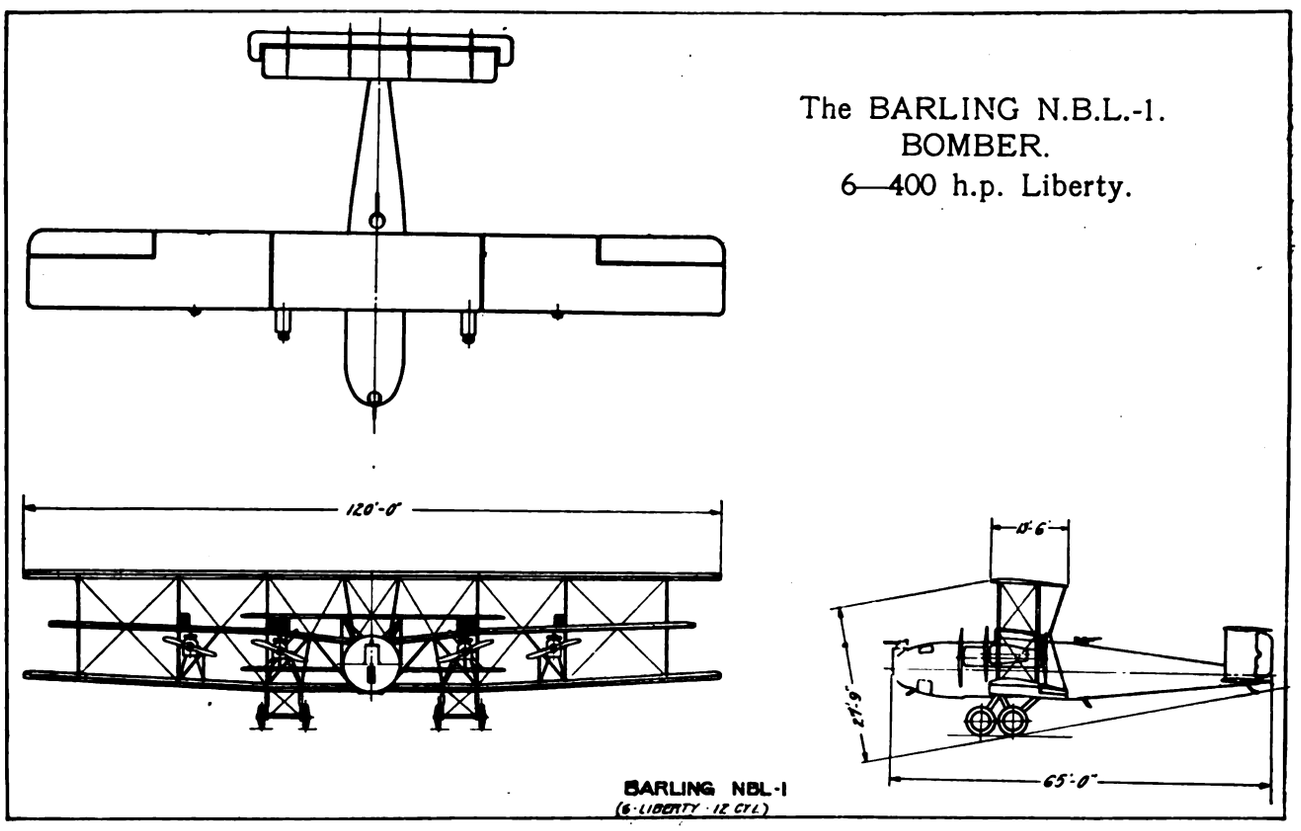
BARLING—*continued.*



Specification of the Barling Bomber NBL-1.

Type of machine	**Multi-Engined Triplane.**
Purpose	**Ling Distance Bombing.**
Crew	**4.**
Span	**120 ft. 36.6 m.).**
Length	**65 ft. (19.8 m.).**
Height	**28 ft. (8.55 m.).**
Chord, upper and lower	**14 ft. (3.96 m.).**
Chord, middle	**10 ft. (3.05 m.).**
Engines	**6—400 h.p. "Liberty."**
Fuel capacity	**2,000 galls. (9,100 l.).**
Oil capacity	**161 galls. (735 l.).**
Bomb load, normal	**5,000 lbs. (2,265 kgs.).**
Weight loaded	**40,000 lbs. (18,150 kgs.).**
Performance.	
High speed	93 m.p.h. (150 km.h.).
Low speed	60 m.p.h. (97 km.h.).
Range, full speed	12 hours.

BELLANCA.

Roos-Bellanca Airplane Company, Omaha, Nebraska.

This new firm was established in the autumn of 1922 for the purpose of manufacturing and marketing aeroplanes designed by Prof. G. Bellanca, the designer of the interesting cabin monoplane which is described below.

BELLANCA TYPE C.F. CABIN MONOPLANE.

This machine may be called the first up-to-date transport aeroplane that was designed, built and flown with success in the United States. As may be seen from the photograph, it has pleasing lines, embodying sound principles of construction and clever detail refinements. It is an externally-braced tractor monoplane which is fitted with the 10-cylinder 90 h.p. Anzani radial air-cooled engine. The cabin accommodates four persons in comfort, with ample room for hand baggage. Ventilation is well provided for. Aft of the cabin is the pilot's cockpit, whence a good view is had in all directions.

The construction of the machine follows fairly orthodox principles, being of the wood-cum-wire-cum-fabric type. The wings have two spars and the necessary ribs, all of wood. The lateral bracing struts, which are steel tubes, are faired so as to present a good aerofoil and thus add to the lift. The L/D of the whole aerodynamic combination is said to be 18. The fuselage is of box type plywood construction.

Pilots who have flown the Bellanca C.F. have been highly pleased with its great manœuvrability and responsiveness to control.

Specification of the Bellanca C.F. Cabin Monoplane.

Type of machine	**Tractor Monoplane.**
Name or type No.	**Bellanca C.F.**
Purpose	**Aerial Transport.**
Span, main wings	**40 ft. (12.2 m.).**
Chord, main wings	**6 ft. 6 in. (1.98 m.).**
Span, strut wings	**22 ft. (6.72 m.).**
Chord, strut wings	**2 ft. 6 in. (0.76 m.).**
Overall length	**23 ft. 10 in. (7.26 m.).**

The Bellanca Cabin Monoplane (90 h.p. Anzani engine).

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BELLANCA—*continued.*

Total wing area	**290 sq. ft. (27 sq. m.).**
Engine type and h.p.	**90 h.p. Anzani.**
Weight empty	**1,040 lbs. (475 kgs.).**
Weight loaded	**1,990 lbs. (908 kgs.).**
Pay load, exclusive of fuel and oil for 600 miles	**680 lbs. (277 kgs.).**
Performance.	
High speed	108 m.p.h. (174 km.h.).
Low speed	40 m.p.h. (65 km.h.).
Climb.	
To 5,000 feet (1,525 m.)	10 mins.
Range, cruising speed	600 miles (965 km.).

No new machines were produced during the past year, but the Ballanca Type C.F. cabin monoplane, piloted by Jack Atkinson, won the Aviation Country Club of Detroit Trophy Race at the St. Louis Air Meet, October 5, 1923. This was a combined speed and efficiency event, and the Bellanca machine scored highest with 674 points, as against 300 and 285 points for its two nearest competitors.

A set of Bellanca wings were built for the U.S. Air Mail Service, to be used on a new Mail DH aeroplane. The trials of these wings were so remarkable that two more sets have been ordered.

Mr. Bellanca left the partnership late in 1923 and is now endeavouring to form a new aircraft manufacturing company.

BOEING.

Boeing Airplane Company, Seattle, Wash.
President : E. N. Gott.

This Company completed in 1923 an order for 200 MB-3A pursuit aeroplanes placed with it by the Army Air Service. These machines are slight modifications of the Thomas-Morse MB-3 type. Other Army Air Service orders involved the construction of ten GA-1 Ground Attack Aeroplanes with two "Liberty" engines (see "All the World's Aircraft, 1922"); the rebuilding of fifty DH-4B's, and the development of an improved Ground Attack Aeroplane, GA-2, fitted with the 700 h.p. Eng. Div. "Model W-1A" engine; of the Boeing Pursuit Plane and of the Boeing DH-4M Corps Observation Plane.

The Boeing Pursuit Plane and the DH-4M both have a welded steel tube fuselage, a method of construction on which the Boeing Company expended much enterprise and ingenuity during the past year. The structure of the DH-4M is identical with that of the DH-4B, except that the wood members of the fuselage have been replaced by steel tubing. In addition to this change, the pilot's seat is modified to accommodate a parachute pack. The sand tests of this machine, made by the A.S. Engineering Division, showed strength factors in excess of the original DH-4 and the DH-4B (the American service modification, with the location of the petrol tank and pilot's seat interchanged).

As a result of these tests the Army Air Service placed with the Boeing Company an order for fifty DH-4M's, which will be issued to the Service in 1924.

THE BOEING PURSUIT MACHINE.

The Boeing Pursuit Plane, which is being tested by the Air Service Engineering Division, is equipped with the Curtiss D-12 engine. This machine, built to Boeing designs in accordance with Air Service specifications, is a tractor biplane. The fuselage is of welded steel tubing, as are the "N" type interplane struts. Both wings are sloping in plan form, and the bottom wing is much smaller in span and chord than the top wing. The radiator is mounted on a slope under the engine. The wings are of wood construction.

Specification of the Boeing Pursuit Machine.

Span	**32 ft. (9.9 m.).**
Length	**22 ft. 10 in. (6.9 m.).**
Weight loaded	**3,000 lbs. (1,360 kgs.).**
Engine	**Curtiss D-12, 400 h.p.**
Max. speed	**165 m.p.h. (266 km.h.).**
Min. speed	**60 m.p.h. (97 km.h.).**
Service ceiling	**23,500 ft. (7,150 m.).**

THE BOEING NAVAL TRAINING MACHINE.

In the spring of 1924 the Boeing Company produced a convertible land-and-water training aeroplane which won the Navy's Training Plane Competition at Pensacola. This machine, which is equipped with the 200 h.p. Wright Radial engine, but may also be fitted with the 220 h.p. Wright E-4 engine, is remarkable for its simple and interchangeable construction. The top and bottom wings, as well as the right and left ailerons and elevators, are interchangeable, which makes the question of maintenance very simple. The landing speed of this machine is 35 m.p.h., a very desirable feature for training. The fuselage is of welded steel tubing. Single or twin float water gears and a land type undercarriage are all equally adaptable to this machine, and can be changed with a minimum effort.

Specification of the Boeing Training Machine.

Span	**36 ft. 10 in. (11.2 m.).**
Weight empty	**1,960 lbs. (890 kgs.).**
Weight loaded	**2,640 lbs. (1,200 kgs.).**
Max. speed	**104 m.p.h. (167 km.h.).**

BOOTH.

Company dissolved. Messrs. Booth and Thurston are now doing aeronautical consulting work. (See Wright.)

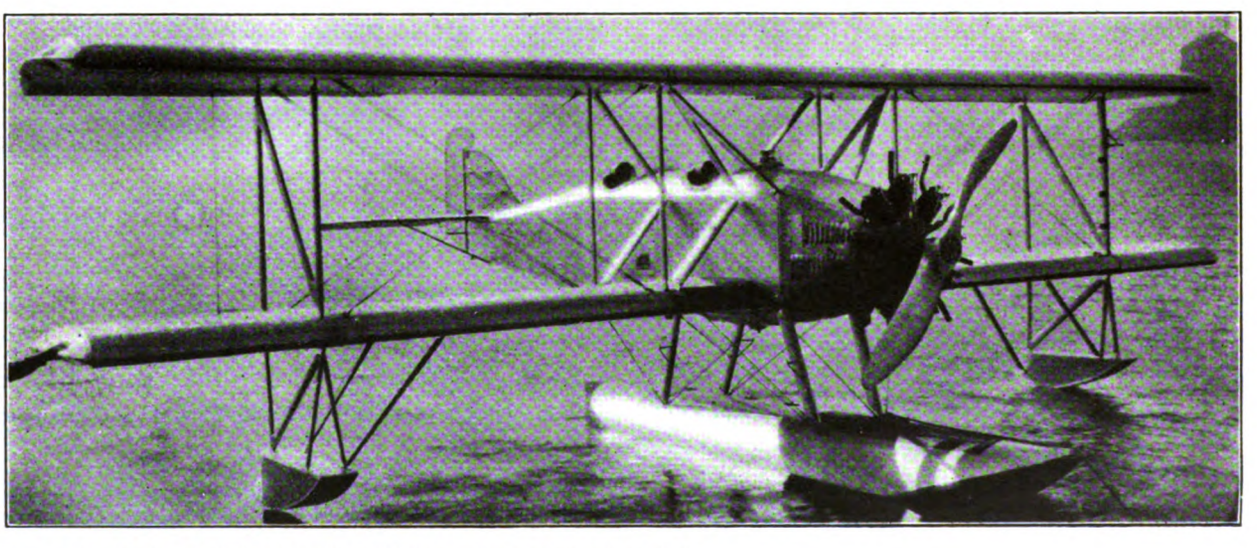
C

CONSOLIDATED AIRCRAFT.

Consolidated Aircraft Corporation, East Greenwich, Rhode Island.

President : R. H. Fleet. Vice-President and Chief Engineer : Virginius E. Clark.

This firm was formed in 1923, after the Dayton-Wright Company had gone out of existence, by Col. V. E. Clark, then Chief Engineer of that company. The Consolidated Aircraft Corporation obtained from the Army Air Service an order for twenty TW-3 training aeroplanes with 180 h.p. Wright E-2 engine. (See "All the World's Aircraft, 1923.")



The Boeing Training Seaplane (200 h.p. Wright radial engine).

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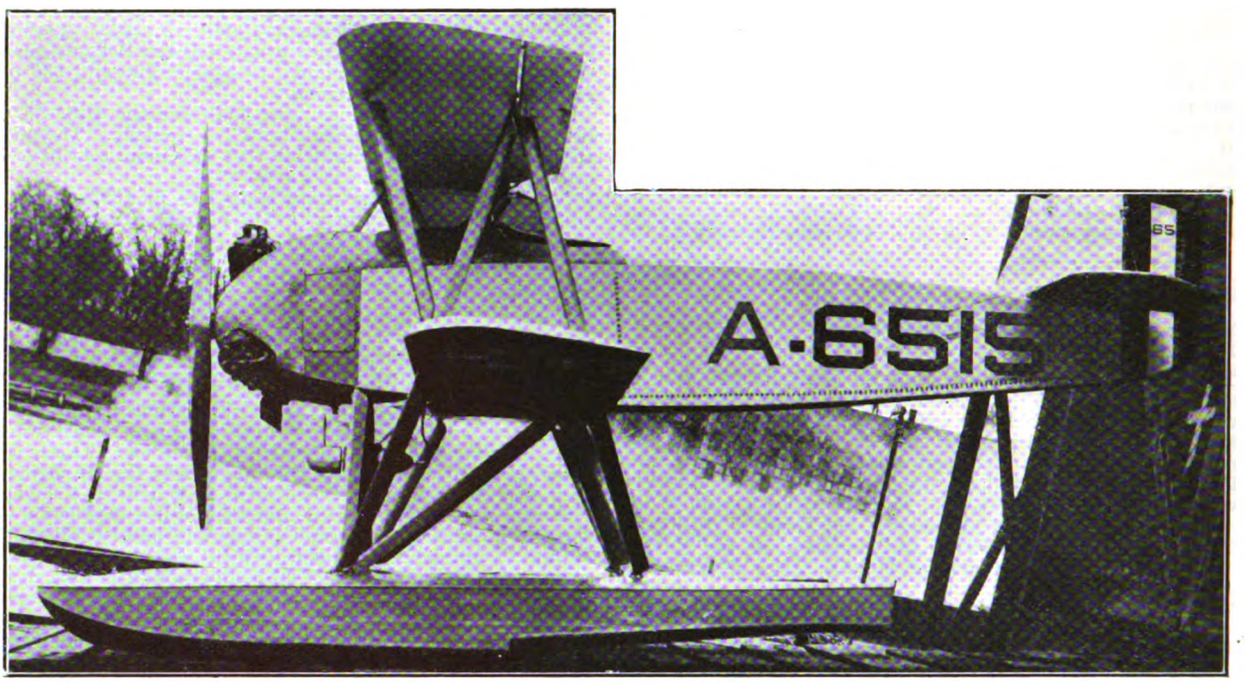
COX-KLEMIN.



The Cox-Klemin XS.-1 Ships' Scout (60 h.p. Wright Radial engine).

Cox-Klemin Aircraft Corporation, College Point, Long Island, New York.

During the past year the Cox-Klemin Company built a large twin-engine amphibian flying-boat fitted with Liberty engines about which no authoritative information is available. The machine was intended for a civilian customer and was built to order.

In February, 1923, this firm received a contract from the Army Air Service for the remodelling of twenty-five DH4 aeroplanes. They have also acquired from the Navy fifty Curtiss MF flying-boats, which are sold to private customers.

Mr. Klemin left the partnership early in 1923.

THE TW-2 TRAINING MACHINE.

The Cox-Klemin TW-2 training plane, the general arrangement drawings of which were published in last year's issue of "All the World's Aircraft," was built as experimental equipment for the Army Air Service. The machine is a tractor biplane with 190 h.p. Wright E-2 engine, wooden wings braced with "N" type interplane struts, and steel tube fuselage with wire bracing. Side-by-side seating arrangement is used for pilot and pupil. The fuel tank is located in the centre section of the top wing. The wing curve used is the U.S.A. 27.

Specifications of the Cox-Klemin TW-2.

Type of machine	**Tractor Biplane.**
Purpose	**Training.**
Seats	**2.**
Span	**29 ft. (8.85 m.).**
Length	**23 ft. 9 in. (7.23 m.).**
Height	**8 ft. 6 in. (2.59 m.).**
Chord	**5 ft. 6 in. (1.67 m.).**
Gap	**5 ft. 2 in. (1.57 m.).**
Wing area	**293 sq. ft. (27 sq. m.).**
Engine	**190 h.p. Wright E-2.**
Weight loaded	**2,400 lbs. (1,090 kgs.).**
Performance.	
High speed	125 m.p.h. (200 km.h.).
Low speed	47 m.p.h. (76 km.h.).

THE XS-1 SHIP'S SCOUT.

During the past year the Cox-Klemin Company produced for the U.S. Naval Aviation a single-seater scout plane, known as Type XS-1, which is designed for short distance reconnaissance service from board small warships, such as destroyers, submarines, etc. This machine is a tractor biplane fitted with twin floats. The construction is conventional, except that the wing struts are steel tubes. The lift truss is carried to the floats by diagonal steel struts. The ailerons are operated by steel tube push rods. The motor can be started by a hand crank from the cockpit. The machine can readily be dismantled and assembled on the deck of a vessel, and interesting experiments have been conducted in connection with submarine work.

Specification of the Cox-Klemin XS-1 Aeroplane.

Type of machine	**Twin Float Tractor Biplane.**
Purpose	**Shipboard Scouting.**
Seats	**1.**
Span	**18 ft. (5.5 m.).**
Length	**18 ft. (5.5 m.).**
Chord	**3 ft. (.92 m.).**
Gap	**3 ft. 6 in. (1.07 m.).**
Engine	**60 h.p. Wright Radial.**
Weight empty	**650 lbs. (295 kgs.).**
Weight loaded	**1,100 lbs. (500 kgs.).**
Performance.	
High speed	100 m.p.h. (161 km.h.).
Low speed	50 m.p.h. (80 km.h.).
Climb.	
To 4,400 ft. (1,340 m.).	10 mins.
Service ceiling	8,400 ft. (2,560 m.).
Endurance	2 hrs.

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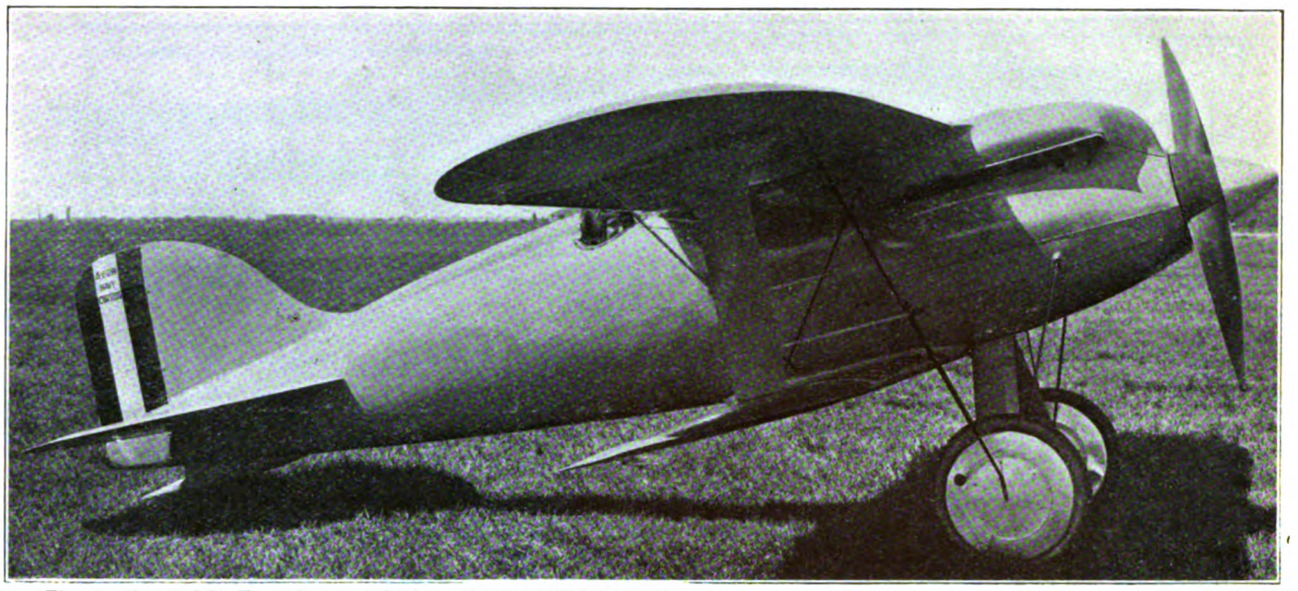


The Curtiss R-2C1 Navy Racer (500 h.p. Curtiss D12A engine).

Curtiss Aeroplane and Motor Company, Inc., Garden City, Long Island, New York.

The Curtiss firm was reorganised in 1923 under the title Curtiss Aeroplane and Motor Company, Inc. The Company has had one of its most successful years in 1923, with the victory of its machines in the Pulitzer Trophy and Schneider Cup races, the raising of the world's maximum speed record to 266.6 m.p.h., the practical demonstration of the wing radiator and of the Curtiss-Reed metal airscrew, and the further improvement of the Curtiss D-12 aircraft engine.

The one Curtiss machine produced in 1923 which stood out among all others was the Navy-Curtiss Model R-2C1 Racer. Lieut. Alford J. Williams, U.S.N., won the Pulitzer Trophy race held at St. Louis over a 200 kilometre distance at an average speed of 243.67 m.p.h., while his team mate, Lieut. H. J. Brow, U.S.N., flying a machine of the same type, finished second at an average speed of 241.78 m.p.h. In November, 1923, these two officers engaged at Mitchel Field, N.Y., in a competition for the world's maximum speed record, which ended with the speed mark being raised by Lieut. Williams to 266.6 m.p.h., on November 4th, when the Secretary of the Navy called a halt to this dramatic duel. These speed trials were flown over a 3-kilometre course under F.A.I. Rules.

THE NAVY-CURTISS MODEL R-2C1 RACER.

Constructionally, the 1923 Navy Curtiss Racer differs only in minor details from the 1922 Army-Curtiss Racer, from which it was developed. The Curtiss D-12 engine was redesigned with $\frac{1}{8}$ in. greater bore, giving 50 h.p. more for a weight of less than $1\frac{1}{3}$ lbs. per h.p. Additional speed was derived from the use of the Curtiss-Reed duralumin propeller, which is merely a sheet of metal twisted to suitable shape, with the thinness of a knife edge at the tips. This airscrew increased the speed of the Racer some 10 m.p.h. as compared with a wooden airscrew.

Other changes involved the wing area, which was slightly augmented, and the bringing of the top wing down flush with the summit of the fuselage. The wing radiators, which had amply proved their worth the preceding year, were retained.

The undercarriage is of the rigid chassis type, with the shock absorbers inside the wheels. To reduce head resistance, the wheels were streamlined with aluminium shields and fabric covered the groove between the wheel and the tyre, so that a smooth oval section was presented to the air.

The body was built of "Curtiss-Ply," a two-ply veneer of spruce $\frac{3}{32}$ in. thick. It has an excellent streamline. The lines of the fuselage were designed around the smallest possible cross-sectional area, merely large enough to fair in the engine and to accommodate the pilot. The fuselage only weighs 127 lbs.

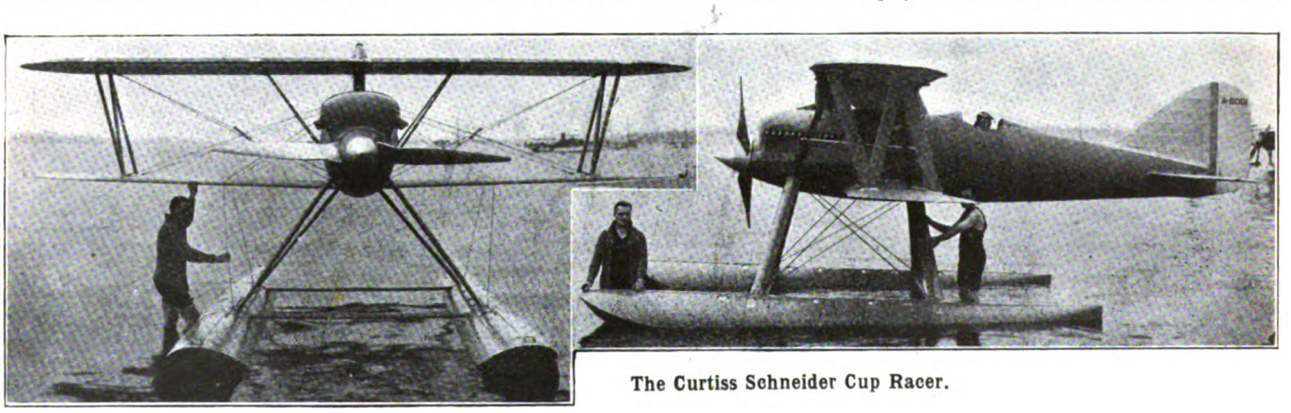
The wings were built on the Curtiss multi-spar system with plywood covering, the rigidity and contour stiffness of which had previously been proved in the Detroit Air Meet, in 1922. The ailerons and tail surfaces have steel and duralumin frames and are linen covered; all controls are actuated by means of internal cables or push rods. There is no external bracing to the tail surfaces nor any external "horns" to any of the control surfaces. The main lift wires are attached to the undercarriage instead of to the fuselage, as is the case in the Army-Curtiss Racer.

Specification of the Navy-Curtiss Racer, R-2C1.

Span, top	**22 ft. (6.72 m.).**
Span, bottom	**19 ft. 3 in. (5.87 m.).**
Chord, top	**4 ft. 8 in. (1.42 m.).**
Chord, bottom	**3 ft. 4 in. (1.01 m.).**
Length	**19 ft. $8\frac{1}{2}$ in. (6.0 m.).**
Height	**6 ft. 10 in. (2.08 m.).**
Wing area	**148 sq. ft. (13.8 sq. m.).**
Engine	**Curtiss D-12a, 500 b.h.p.**
Weight loaded	**2,071 lbs. (942 kgs.).**
Wing loading	**14 lbs./sq. ft. (68.2 kgs./sq. m.).**
Power loading	**4.17 lbs./h.p. (1.88 kgs./h.p.).**
Max. speed	**266.6 m.p.h. (429 km.h.)**
Min. speed	**74 m.p.h. (119 km.h.).**
Ceiling (estimated)	**32,000 ft. (9,800 m.).**

CURTISS CR-3 "SCHNEIDER CUP" RACER.

The two Curtiss CR-3 Racers which the U.S. Navy entered for the 1923 Schneider Cup race, and one of which, piloted by Lieut. David Rittenhouse, won the Cup for America, were not entirely new machines. In fact, they had the same wings and fuselage as the land type racer on which Bertrand Acosta won the 1921 Pulitzer Trophy race, and the same machines were



The Curtiss Schneider Cup Racer.

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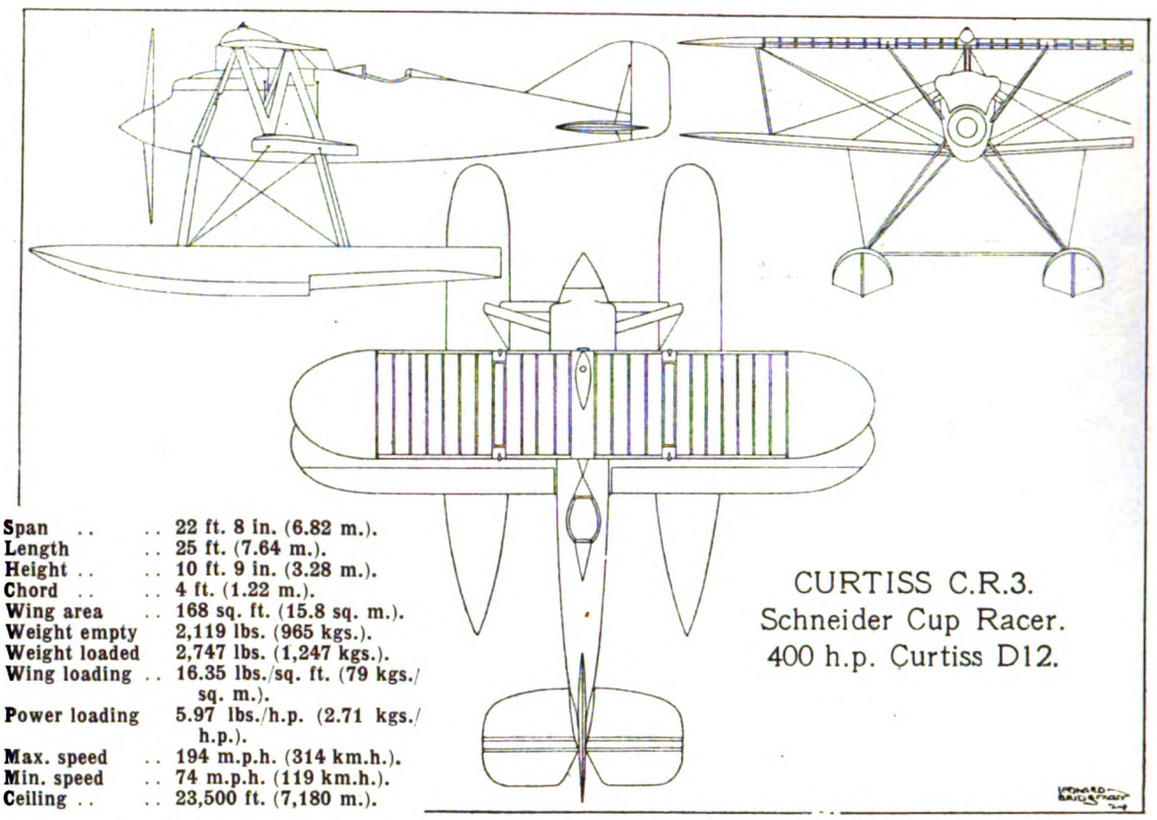
CURTISS—*continued.*



Span	22 ft. 8 in. (6.82 m.).
Length ..	25 ft. (7.64 m.).
Height	10 ft. 9 in. (3.28 m.).
Chord	4 ft. (1.22 m.).
Wing area ..	168 sq. ft. (15.8 sq. m.).
Weight empty	2,119 lbs. (965 kgs.).
Weight loaded	2,747 lbs. (1,247 kgs.).
Wing loading ..	16.35 lbs./sq. ft. (79 kgs./sq. m.).
Power loading	5.97 lbs./h.p. (2.71 kgs./h.p.).
Max. speed ..	194 m.p.h. (314 km.h.).
Min. speed ..	74 m.p.h. (119 km.h.).
Ceiling	23,500 ft. (7,180 m.).

CURTISS C.R.3.
Schneider Cup Racer.
400 h.p. Curtiss D12.

entered by the U.S. Navy in the 1922 Pulitzer Trophy race, where they finished third and fourth, respectively. For the 1923 Schneider race the identical machines were taken out of storage and fitted with specially built floats, together with the Curtiss D-12 engine and the Curtiss-Reed metal airscrew. Most of the fuel was carried inside the fuselage, but as this arrangement did not give sufficient tankage for the race, an 8-gallon auxiliary tank was placed in each float, from which the fuel was pumped up to the main tank during flight. In the trial flights each machine made better than 194 m.p.h., but in order not to disclose this figure, a speed of only 175 m.p.h. was officially announced.

Lieut. Rittenhouse won the Schneider Cup at an average speed of 177.38 m.p.h., and Lieut. Rutledge Irvine, who finished second on the sister ship of this plane, made 173.46 m.p.h.

CURTISS PURSUIT AEROPLANE.

An interesting pursuit aeroplane was produced by the Curtiss Company late in 1922. Lieut. Russell L. Maughan, A.S., used this machine in two attempts to fly from the Atlantic to the Pacific between dawn and dusk in July, 1923, and in his second attempt covered 1,930 miles in 15 hours, but was forced to abandon the flight on account of a broken oil cooler. The flight was to be made in five stages from New York to San Francisco. In the first attempt, Lieut. Maughan covered 1,300 miles in 9 hours, but abandoned the attempt as he was behind schedule, owing to head winds.

Twenty-five machines of this type are under construction in the Curtiss factory at Garden City for the U.S. Army Air Service. Detailed information on the Curtiss Pursuit Aeroplane is not yet authorized, but the following particulars, together with the accompanying photograph, will give a general idea of its features.

The Curtiss Pursuit Aeroplane is a two-bay tractor biplane with the 375 h.p. Curtiss D-12 engine. The fuselage is largely built of duralumin, while the wings are of wood and fabric. Ailerons are carried on the top wing only, together with wing radiators. The wing curve is extremely flat. The interplane bracing is of the "N" type. The undercarriage, of the double tripod type, is of steel tubing.

The performance of the machine is very remarkable in every way, and pilots who have flown it have expressed the greatest admiration for its wonderful all-round performance.

The Curtiss Schneider Cup Racer (400 h.p. Curtiss D12 engine).

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CURTISS—*continued.*

The Curtiss Pursuit Aeroplane (400 h.p. Curtiss D12 engine).

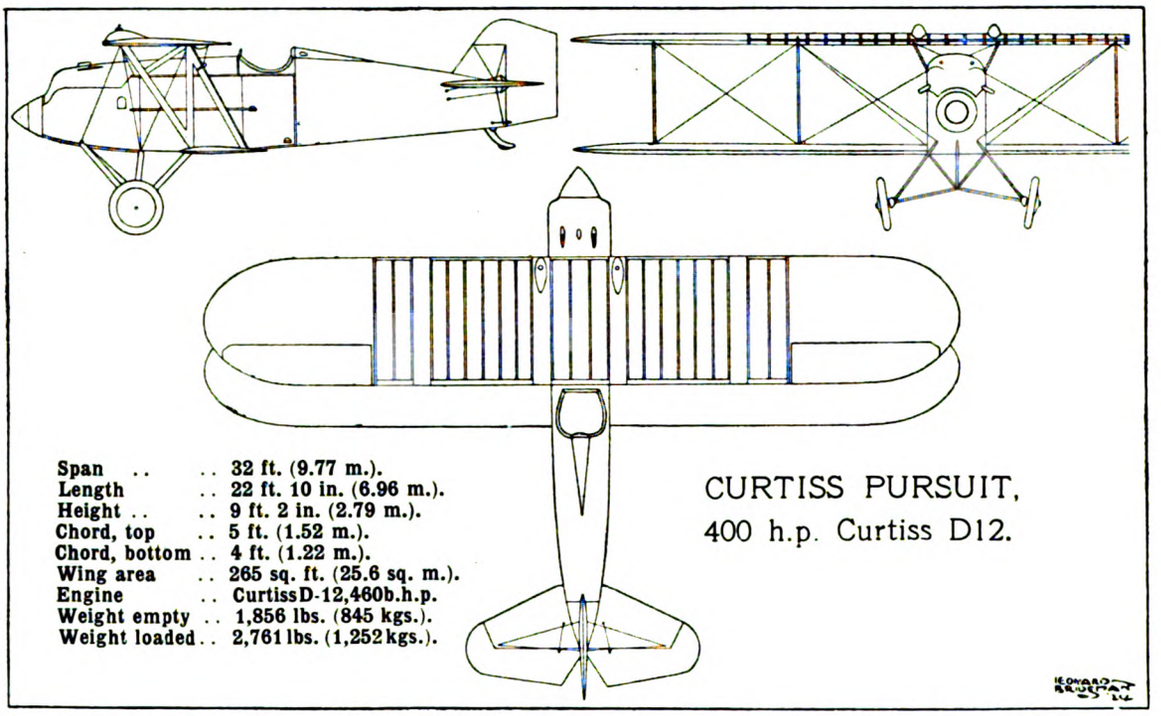
The main dimensions are given on a drawing, and further particulars are attached hereafter.

Wing loading	**10.4 lbs./sq. ft. (49 kgs./sq. m.).**
Power loading	**6 lbs./h.p. (2.73 kgs./h.p.).**
Max. speed	**170 m.p.h. (274 km.h.).**
Min. speed	**62 m.p.h. (100 km.h.).**
Climb in 10 mins.	**14,700 ft. (4,500 m.).**
Service ceiling	**27,800 ft. (8,500 m.).**

CURTISS NIGHT MAIL AEROPLANE.

The Curtiss Company also produced three experimental Mail Aeroplanes for the U.S. Air Mail Service, which had ordered them for the particular purpose of the night flying experiments between Chicago and Cheyenne. These planes were successfully test flown and accepted in September, 1923.

This type of aeroplane is a one-bay tractor biplane with the Curtiss C-6, 160 h.p. engine, wing radiators, wing fuel tanks,


CURTISS PURSUIT,
400 h.p. Curtiss D12.
Span .. .. 32 ft. (9.77 m.).
Length .. 22 ft. 10 in. (6.96 m.).
Height .. .. 9 ft. 2 in. (2.79 m.).
Chord, top .. 5 ft. (1.52 m.).
Chord, bottom .. 4 ft. (1.22 m.).
Wing area .. 265 sq. ft. (25.6 sq. m.).
Engine .. Curtiss D-12, 460 b.h.p.
Weight empty .. 1,856 lbs. (845 kgs.).
Weight loaded .. 2,761 lbs. (1,252 kgs.).

The Curtiss Night-Mail Aeroplane (160 h.p. Curtiss C6 engine).

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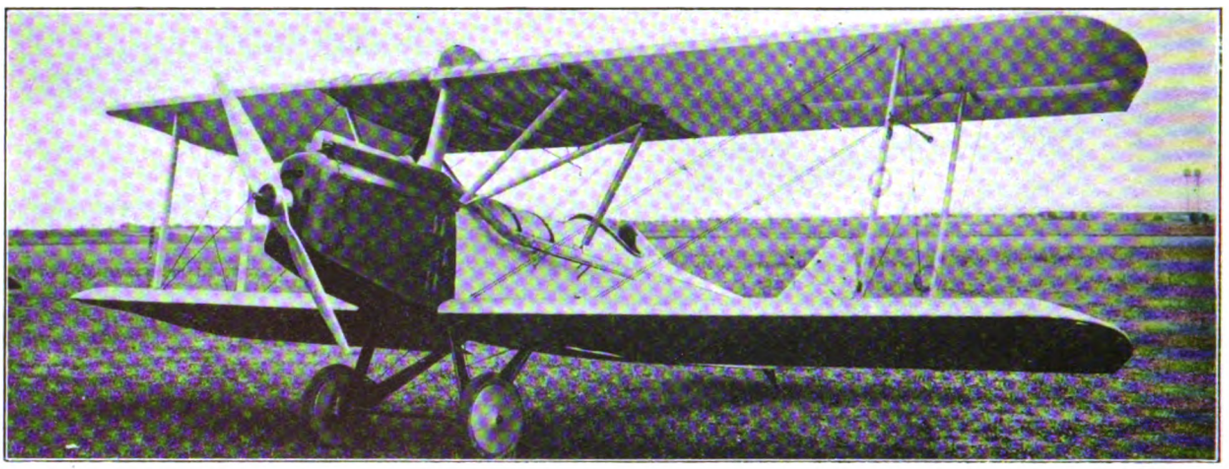
CURTISS—*continued.*



The Curtiss Night Mail Plane (160 h.p. Curtiss C6 engine).

Curtiss-Reed metal airscrew and night-flying equipment. Although the specification only called for a mail capacity of 300 lbs., 500 lbs. of mail load has been carried in flying trials. On account of the proposed night landings, a low landing speed was desired, together with a good high speed. The Curtiss Mail Aeroplane provided this with a high speed of 106 m.p.h. and a low speed of 44 m.p.h. The construction of the fuselage is the conventional wood and wire type.

Performance of the Curtiss Night-Mail Plane :

High speed	106 m.p.h. (171 km.h.).
Low speed	44 m.p.h. (71 km.h.).
Climb.	
To 5,600 ft. (1,700 m.)	10 mins.
Service ceiling	12,000 ft. (3,660 m.).
Endurance, cruising	5 hrs.

CURTISS CS-1 NAVAL AEROPLANE.

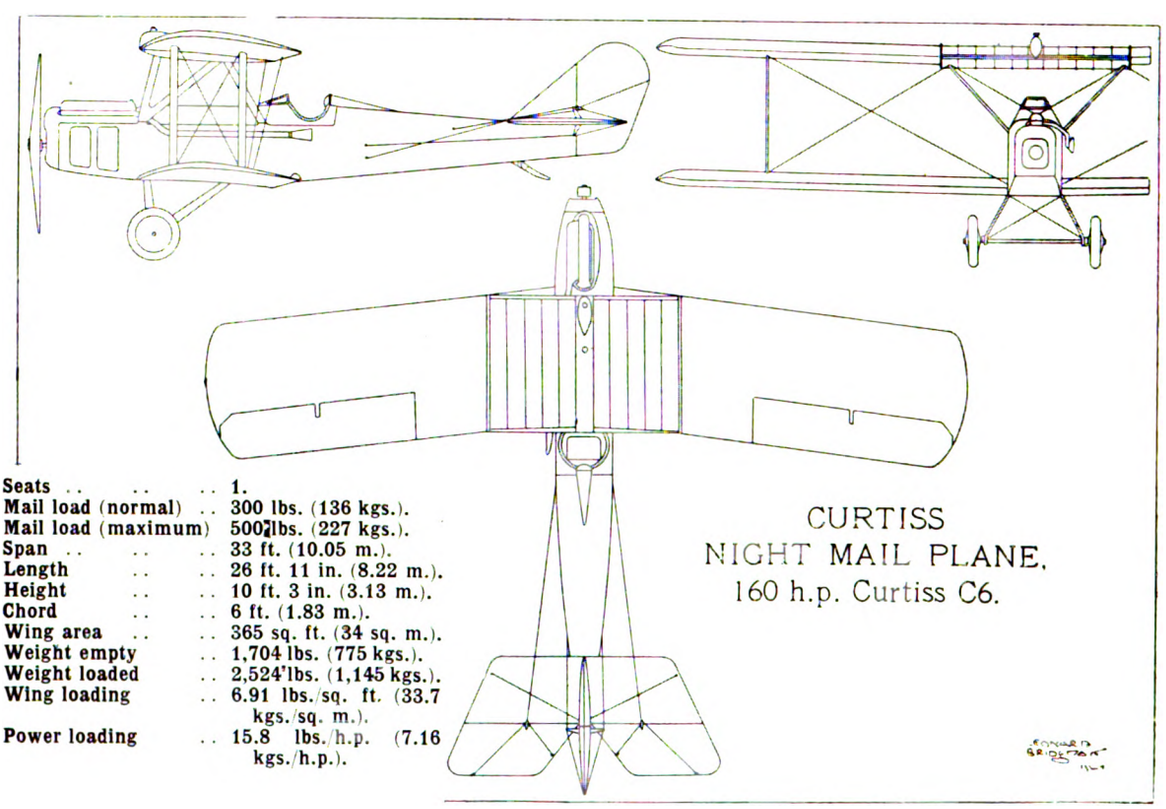
The CS-1 Naval Aeroplane combines the functions usually performed by three distinct types—bombing, torpedo dropping and long range scouting. This aeroplane, which may be used as a land or water plane, is the lightest American plane for its horsepower that has ever been built, as it flies with a useful load greater than its structural weight.

In the past it has been necessary to construct different types of planes for the different functions that the CS-1 can fill in the Naval Air Service, so that the advent of this machine marks an important advance in aeroplane design for naval purposes. The CS-1 is largely built of steel and duralumin, only the wings being of wood and fabric construction. The wings can be made to fold back against the fuselage. The sea undercarriage consists of two long floats.

A modification of the CS-1, known as the CS-2, was prepared for the tentative Arctic Air Expedition of the U.S. Navy. The latter-named plane is said to have a cruising range of 3,000 miles and carries a main petrol tank of 270 galls. capacity. The engine is a 650 h.p. Wright T-3.

Government orders placed with the Curtiss Company in 1923 comprised, besides the two Navy Racers for the Pulitzer Trophy and the three Night Mail Aeroplanes, fifty NBS-1 (Glenn Martin type) Bombers for the Army Air Service and thirty-three Model TS-1 Naval Fighting Aeroplanes.

Orders in hand include eight Model CS-1 Naval Three-Purpose Aeroplanes for the U.S. Naval Aviation, and twenty-five Curtiss Pursuit Aeroplanes for the U.S. Army Air Service.



Seats	1.
Mail load (normal)	300 lbs. (136 kgs.).
Mail load (maximum)	500 lbs. (227 kgs.).
Span	33 ft. (10.05 m.).
Length	26 ft. 11 in. (8.22 m.).
Height	10 ft. 3 in. (3.13 m.).
Chord	6 ft. (1.83 m.).
Wing area	365 sq. ft. (34 sq. m.).
Weight empty	1,704 lbs. (775 kgs.).
Weight loaded	2,524 lbs. (1,145 kgs.).
Wing loading	6.91 lbs./sq. ft. (33.7 kgs./sq. m.).
Power loading	15.8 lbs./h.p. (7.16 kgs./h.p.).

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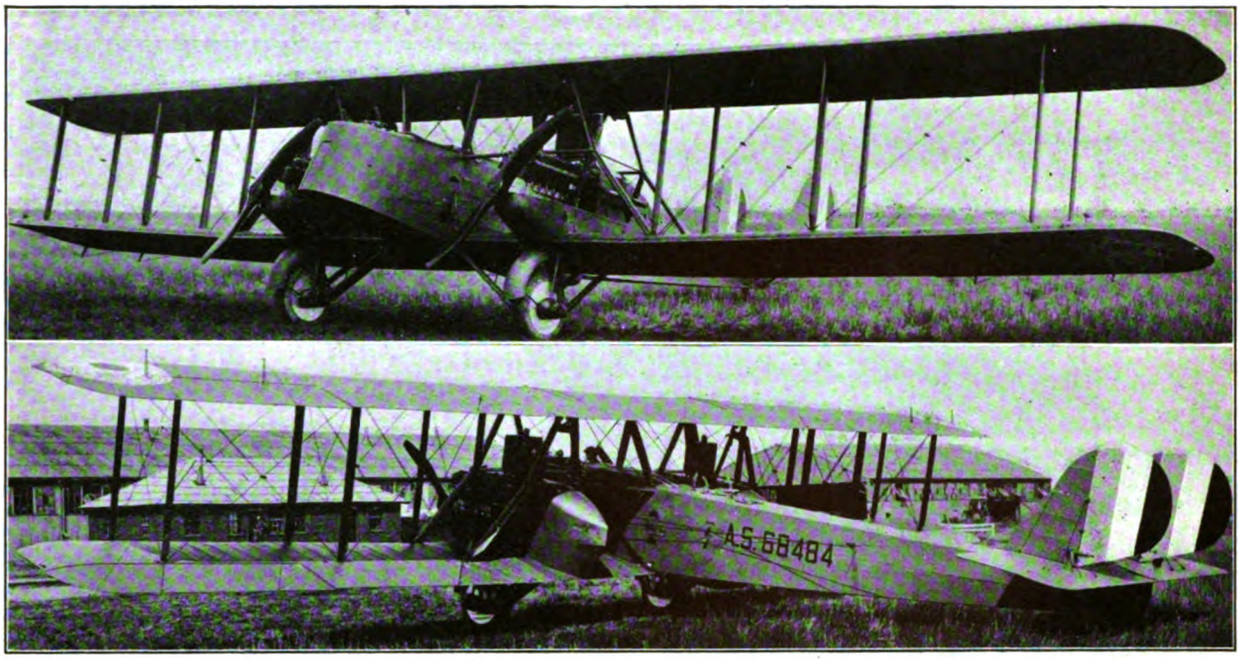
CURTISS—*continued.*

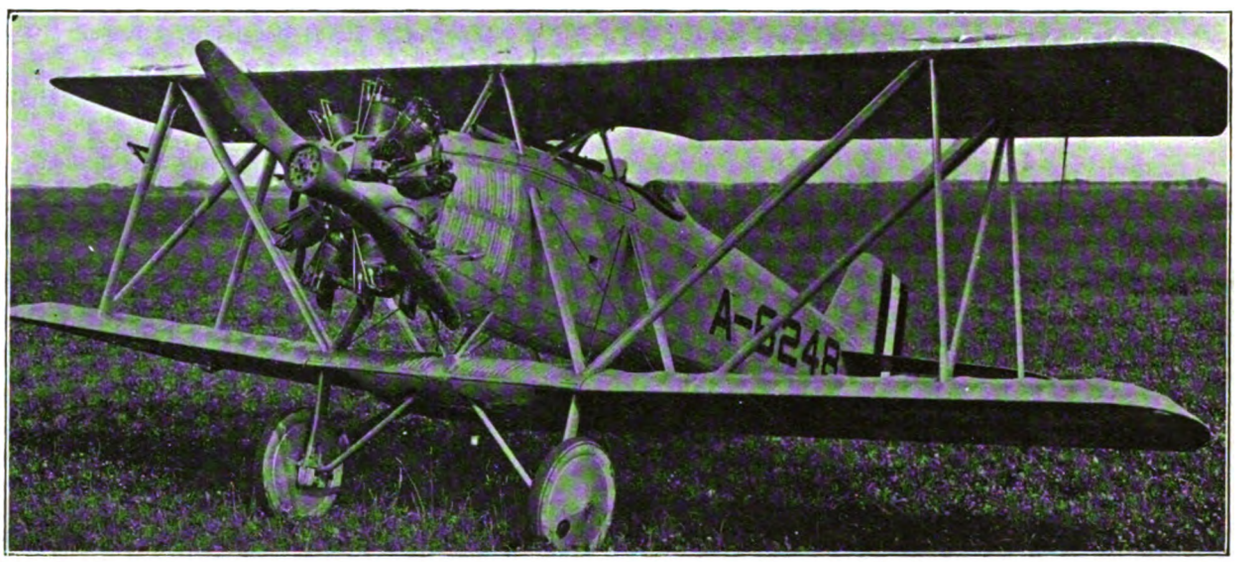


The N.B.S1 Night Bomber, built by the Curtiss Company (2—400 h.p. "Liberty" engines).

Specification of the CS-1 Naval Aeroplane.

Seats	**2.**
Span	**56 ft.**
Length	**34 ft.**
Height	**11 ft.**
Engine	**550 h.p. Wright T-2.**

Performance.	
High speed	105 m.p.h.(as land plane).
Low speed	55 m.p.h. (as land plane).
Range, cruising	2,200 miles.
Armament	**2 machine guns on Scarff ring.**



The T.S1 Naval Single-seater (200 h.p. Wright radial engine). This machine is of official design, but has been built in quantity by the Curtiss Co. It is the standard single-seater for Naval pursuit squadrons. Interesting features are the rigid wing-bracing, interchangeable floats or wheel undercarriage, and petrol tank in the bottom centre-section, which can be dropped in case of emergency.

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D

DAYTON-WRIGHT.

A Dayton-Wright Float Amphibian (200 h.p. Wright E4 engine).

Dayton-Wright Airplane Company, Dayton, Ohio.

This Company was dissolved in 1923, as the General Motors Corporation, its parent organisation, decided to discontinue aircraft manufacturing, due to the small profits accruing from it. (See also under Consolidated Aircraft.)

DOUGLAS.

The Douglas Company. Offices and Factory: 2,435 Wiltshire Boulevard, Santa Monica, California. President and Chief Engineer: Donald W. Douglas. Vice-President: H. H. Wetzel.

The Douglas Company established a strong reputation with its first Service machine, built for the U.S. Naval Air Service—the Douglas Torpedo Plane, fitted with 400 h.p. "Liberty" engine. This machine is now the standard Service equipment of the Bombing and Torpedo Plane Squadrons of the U.S. Navy. Six of these planes were built by the Naval Aircraft Factory, in addition to large numbers built by the Douglas Company and other constractors, the L.W.F. Company in particular.

THE DOUGLAS DT-2 TORPEDO PLANE.

The Douglas DT-2 Torpedo Plane is a machine of extremely sturdy construction, a requirement naturally desired for operations at sea with the fleets. It is a single-bay tractor biplane with the 400 h.p. "Liberty" engine and nose radiator. The first model, DT-1, had side radiators.

The fuselage is of welded steel tubing, braced with tie-rods and provided with stiffening gussets. It is built in three detachable sections—engine section, mid section and tail section—the two first-named being plated with aluminium, while the tail section is covered with fabric.

The vertical tail surfaces have conventional wood frames, while the horizontal tail surfaces are made of welded steel tubing. The tail skid is a steel tube and is steerable.

The undercarriage is remarkable for its wide tread—10 ft.—and consists of two steel tube Vees, laterally braced to the fuselage by two steel tubes faired with wood, and carrying rubber-sprung wheel for land use. For sea use two long wooden floats may quickly be substituted. There is no tail float.

The wings are of standard box beam and built-up rib construction of wood and fabric covered. The top wings are in three panels, the bottom wings in two panels.

Specification of the Douglas DT-2 Plane.

Seats	**1.**
Span, upper and lower	**50 ft. (15.25 m.).**
Length	**37 ft. 7½ in. (11.5 m.) (with floats).**
Height	**15 ft. (4.57 m.).**
Chord	**7 ft. 6 in. (2.43 m.).**
Wing area	**707 sq. ft. (66 sq. m.).**
Engine	**400 h.p. "Liberty."**

The Douglas DT-4 Bomber (Wright T3 650 h.p. engine).

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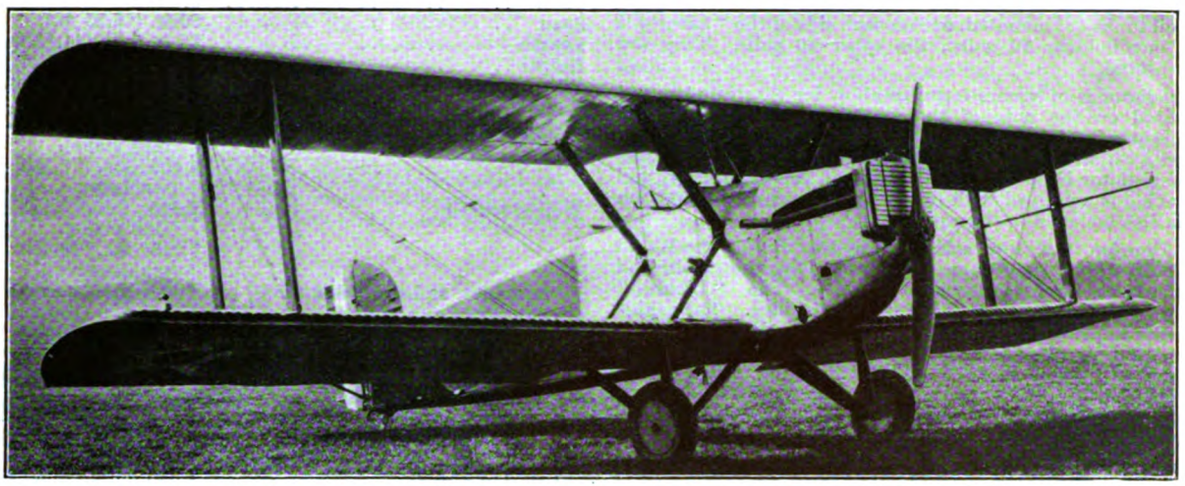
DOUGLAS—*continued.*



The Douglas " World Cruiser " (400 h.p. " Liberty " engine).

Performance.

High speed	100 m.p.h. (161 km.h.).
Low speed	50 m.p.h. (80 km.h.).
Climb.	
To 3,000 ft. (915 m.)	10 mins.
Service ceiling	6,500 ft. (2,000 m.).

THE DOUGLAS DT-4 BOMBING AEROPLANE.

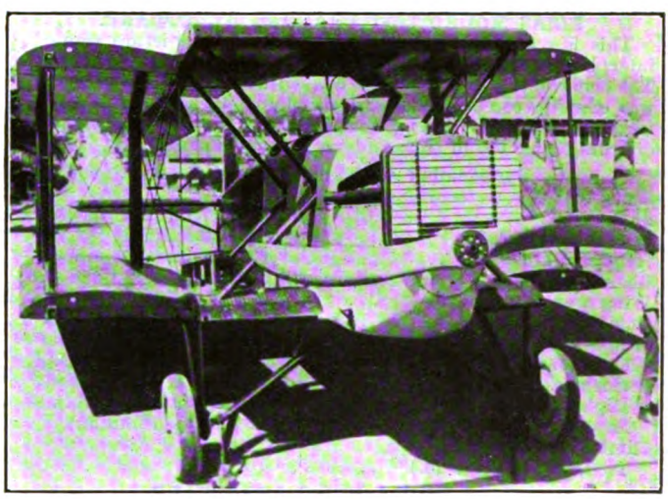
This aeroplane is identical with the DT-2 Torpedo Plane, except for the engine, which is a 650 h.p. Wright T-3, and the performance, which is considerably improved. It is to be noted that owing to the light weight of the Wright T-3 engine it was possible to substitute it for the " Liberty " engine without any structural changes in the machine, and so obtain a surplus power of 250 h.p.

The performance of the DT-4, with a bomb load of 1,650 lbs. (750 kgs.), is the following :—High speed, 115 m.p.h. (185 km.h.) ; low speed, 53 m.p.h. (85 km.h.) ; service ceiling, 14,300 ft. (4,360 m.). The gross weight of the machine in this case is 6,800 lbs. (3,090 kgs.). The useful load includes a crew of two, two guns, radio, signal equipment and instruments, with fuel for three hours cruising and additional tankage for approximately one hour.

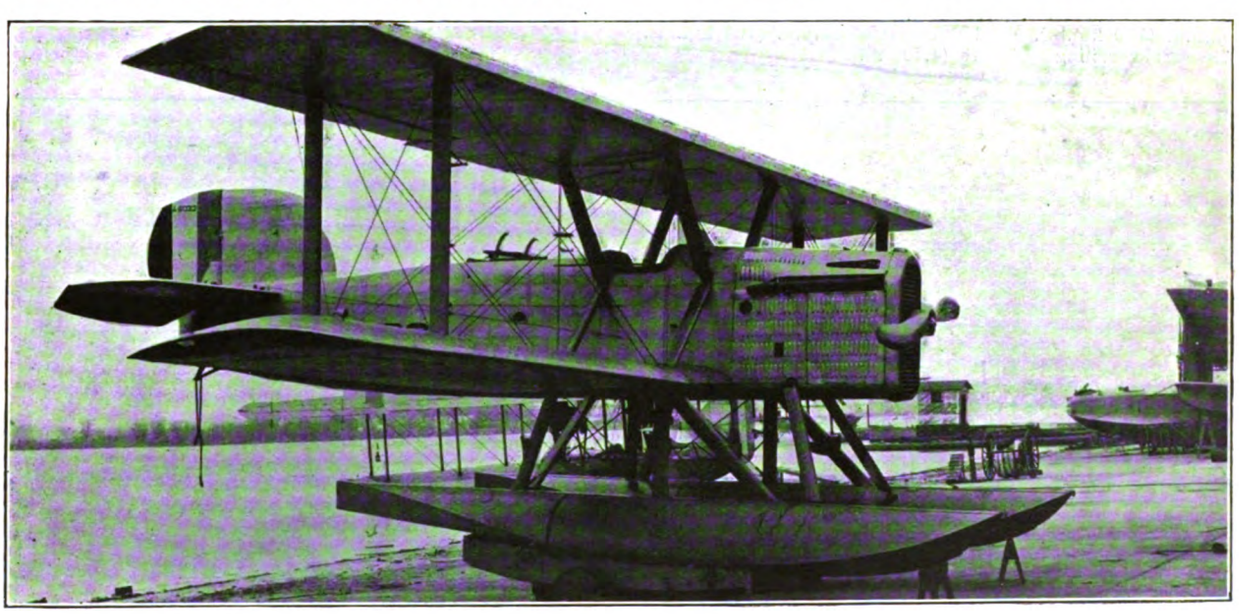
THE DOUGLAS WORLD CRUISER.

The Douglas World Cruiser, as far as its structure is concerned, is identical with the Douglas DT-2 Torpedo Plane. The internal equipment, however, which was specially designed for the Round-the-World of the U.S. Army Air Service, is of course quite different, insofar as the weights allowed for the standard military load (torpedo with release gear, firing sight, etc.) were used to increase the range of the machine to approximately 2,200 miles by the fitting of extra petrol and oil tanks.

The Douglas WC carries, as a land plane, six petrol tanks of aluminium with a total capacity of 600 galls., or nearly two tons. One tank, of the gravity type, holds 60 galls. and is located in the centre section of the top wing ; the second tank (150 galls.) in the engine section, just aft of the fire wall ; the third (160 galls.) in the mid section, below the pilot's floor ; the fourth (105 galls.) in the tail section, underneath the rear cockpit ; and the fifth and sixth tanks, of 62½ galls. each, are situated one each in the bottom wing roots. When the machine is fitted with floats, the second (150 galls.) petrol tank is removed.



The Douglas " World Cruiser " with wings folded.



The Douglas DT-2 Torpedo Seaplane (400 h.p. " Liberty " engine).

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DOUGLAS—*continued.*

Two oil tanks are mounted, one on each side of the "Liberty" engine, one holding 20 galls., the other 30 galls. They are interconnected.

The radiator is of square form, to allow for easy repairs, and is mounted on the nose of the fuselage. A 10-gall. copper reserve water tank is installed in the pilot's cockpit and is provided with an air pump, so that the pilot may pump water into the radiator if necessary. There is an electric starter, and the machine is equipped with dual controls. A radio direction finder is also included in the equipment.

The Douglas WC was selected for the Round-the-World Flight both for its ruggedness (well proved by the DT-2) and its remarkable weight-carrying capacity. The "Liberty" engine was selected for its long record of reliability. The engine used is the improved "Liberty," which weighs less than 2 lbs. per h.p. and develops 420 h.p. The air intakes have been rearranged to prevent back firing and fire hazard; petrol pumps for the carburettor are so fitted as to reduce danger from petrol under presssure; also, stronger timing gears have been provided to operate the two ignition systems.

The wheels are 36 × 8 in. in size and can quickly be replaced by floats.

Specification of the Douglas World Cruiser.

Seats	**2.**
Span	**50 ft. (15.25 m.).**
Length	**35 ft. 6 in. (11.12 in.).**
Height	**13 ft. 7 in. (4.15 m.).**
Wing area	**707 sq. ft. (66 sq. m.).**
Engine	**420 h.p. "Liberty."**
Weight empty	**4,300 lbs. (1,945 kgs.) (land plane).**
	5,100 lbs. (2,295 kgs.) (seaplane).
Weight loaded	**6,915 lbs. (3,112 kgs.) (land plane).**
	7,715 lbs. (3,492 kgs.) (seaplane).
Performance, as Land Plane.	
High Speed	103 m.p.h. (166 km.h.).
Low speed	53 m.p.h. (86 km.h.).
Service ceiling	10,000 ft. (3,000 m.).
Cruising range	2,200 miles (3,550 km.).
Performance as Seaplane.	
High speed	100 m.p.h. (161 km.h.).
Low speed	53 m.p.h. (86 km.h.).
Service ceiling	7,000 ft. (2,130 m.).
Cruising range	1,650 miles (2,660 km.h.)

E

ELIAS.

G. Elias & Brother, 965, Elk Street, Buffalo, New York.

This firm produced during the past year two experimental aeroplanes for the Army Air Service: one, the Model TA-1 training machine with 200 h.p. Wright radial engine; and the other, the Model NBL-2 long distance night bomber, with two 400 h.p. "Liberty" engines.

ELIAS MODEL TA-1 TRAINING AEROPLANE.

This is a single-bay tractor biplane, with "picture frame" interplane truss, such as was first used on the Lepère biplane. The construction is throughout conventional, but a special effort was made to use only the most simple members and fittings, to facilitate repairs. The different parts are very accessible, affording a saving in time and expense on maintenance.

Specification of the Elias Model TA-1.

Seats	**2.**
Span	**32 ft. 7 in. (9.95 m.).**
Length	**24 ft. 9 in. (7.22 m.).**
Height	**12 ft. 1 in. (3.68 m.).**
Chord	**5 ft. 8 in. (1.72 m.).**
Wing area	**337 sq. ft. (31.2 sq. m.).**
Engine	**200 h.p. Wright Radial.**
Weight empty	**1,596 lbs. (723 kgs.).**
Weight loaded	**2,235 lbs. (1,025 kgs.).**
Performance.	
High speed	87 m.p.h. (140 km.h.).
Low speed	48 m.p.h. (78 km.h.).
Climb.	
To 6,500 ft. (2,000 m.)	16¾ mins.

ELIAS MODEL NBL-2 AEROPLANE.

Detail specifications of this machine are not yet available for publication. The total wing area is 1,500 sq. ft. (139 sq. m.), the useful load 6,000 lbs. (2,710 kgs.), the designed high speed 105 m.p.h. (169 km.h.), the low speed 65 m.p.h. (105 km.h.), and the service ceiling 13,500 ft. (4,100 m.).

G

GALLAUDET.

Gallaudet Aircraft Corporation, East Greenwich, Rhode Island.

The Gallaudet Aircraft Corporation was dissolved in 1923 and its factory was acquired by the newly-formed Consolidated Aircraft Corporation.

One of the most interesting products of the Gallaudet Company was the Model DB-1 Two-seater Day Bomber, with the Engineering Division's 700 h.p. W-1 engine, which was built for the Army Air Service. This machine is a cantilever monoplane of 66 ft. 8 in. span and 42 ft. length. The structure is entirely of metal, but the wing covering on the second machine of this type was of fabric. The workmanship is exceptionally fine. The weight loaded is 8,600 lbs. A notable feature of this machine is that the pilot is seated right aft of the engine, while the gunner's cockpit is located half-way back towards the tail, where a wonderful arc of fire is obtained.

The Gallaudet Company also produced in 1923 an all-metal Pursuit Aeroplane fitted with the 300 h.p. Packard engine, which is undergoing tests at McCook Field.

The Elias TA-1 Training Machine (200 h.p. Wright radial engine).

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H

HEATH.

Heath Airplane Company, Chicago.
President : E. B. Heath.

This Chicago firm built, late in 1922, the Heath "Favorite," a modernized version of the Curtiss JN-4, with the 90 h.p. Curtiss OX-5 engine, which has given a good account of itself. The machine is chiefly remarkable for the thick wings of Glenn Martin No. 2 section, set in biplane form. The wing area is 300 sq. ft., the weight empty 1,400 lbs., weight loaded 2,100 lbs., and the span 33 ft. The high speed is 85 m.p.h. and the low speed 36 m.p.h.

As the "Favorite" is largely used for night advertising flights, the bottom wings are provided with an internal lighting equipment, and the lower surface of the wings are left frosted, so that advertising signs painted thereon can easily be distinguished from the ground.

HUFF-DALAND.

The Huff-Daland TW-5 Seaplane (200 h.p. Wright E4 engine).

Huff, Daland & Company, Inc., Ogdensburg, New York.

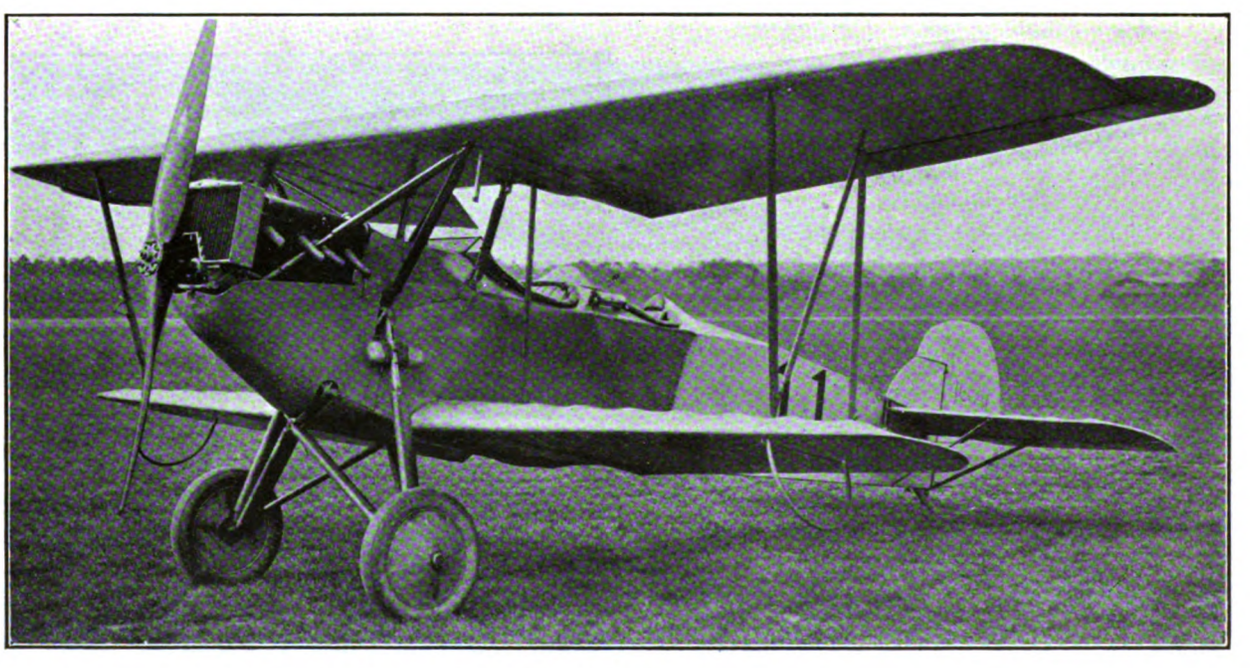
The latest aeroplanes produced by the Huff-Daland Company comprise an improved model of the "Petrel" commercial three-seater, known as Model 4 ; the Model TW-5 and TA-6 Army Training Aeroplanes ; and the Model HN-2 Navy Training Seaplane.

All these models are structurally very similar, being cantilever biplanes. They have the same type of tapering wings, "N" type interplane struts, fuselage and landing gear (except the HN-2, which carries floats), but while the "Petrel" Model 4 and TW-5 are fitted with the 200 h.p. Wright E-4 engine, the TA-6 carries the 200 h.p. Wright Radial engine. The TW-5 has also been flown with the 90 h.p. Curtiss OX-5 engine.

The fuselage is a welded steel tube structure without any bracing wires. While alignment problems during manufacture presented unusual difficulties, they were more than compensated by the rigid structure obtained, which does away with the necessity of realignment, due to hard usage or climatic changes.

The wings are built in complete units, have the U.S.A.35 curve and taper in plan as well as in section. The bottom wing is much smaller in span and chord than the top wing, an arrangement which makes for excellent visibility from the pilot's seat. The wings are of conventional wood and fabric construction. The top wing is carried on a steel tube cabane and two adjustable flying struts of steel tubing. Ailerons are carried on the top wings only and the aileron control is by means of a push rod. All external wiring is thus eliminated from the *cellule*.

The landing gear is of the Huff-Daland double tripod type, which eliminates the axle between the wheels and the consequent danger of fouling and nosing over in tall grass or grain. The rubber chord shock absorbers are mounted on the upper end of the two telescoping tubes, where they are clear of all contact with dirt and oil. The shock absorber unit can be taken down by removing a single bolt, while the whole undercarriage can be removed by undoing four bolts. The tail skid is steerable.



The Huff-Daland "Petrel IV" (200 h.p. Wright E4 engine).

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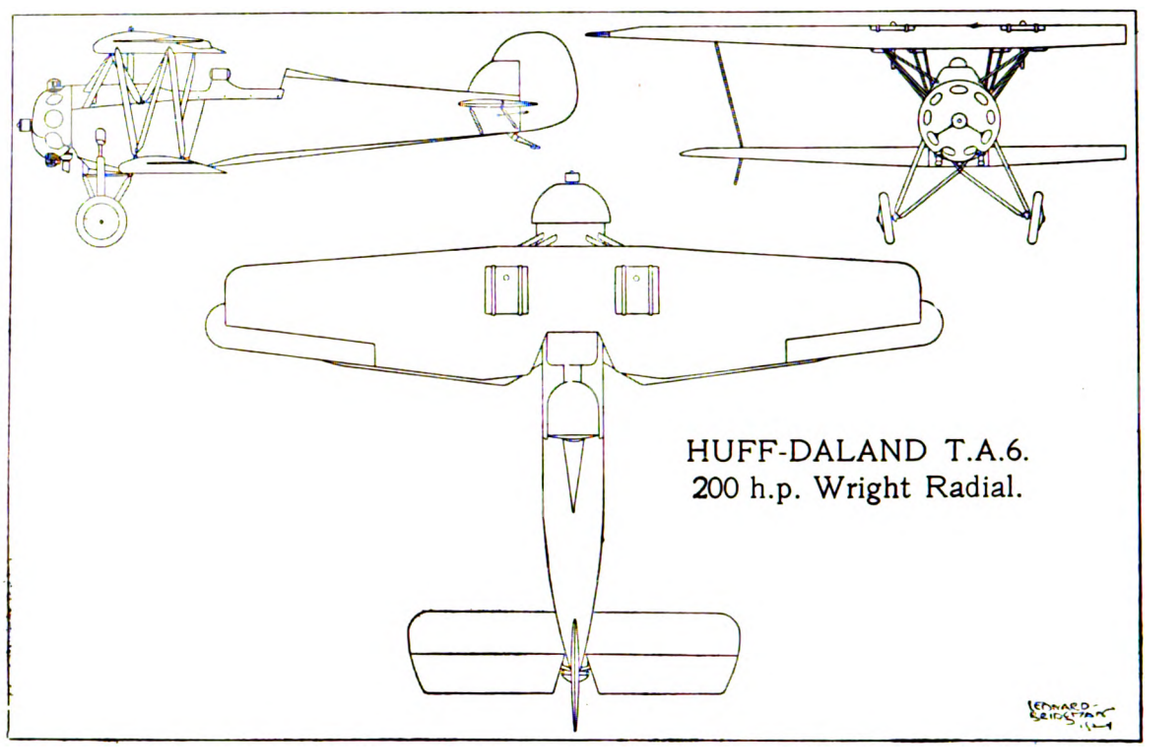
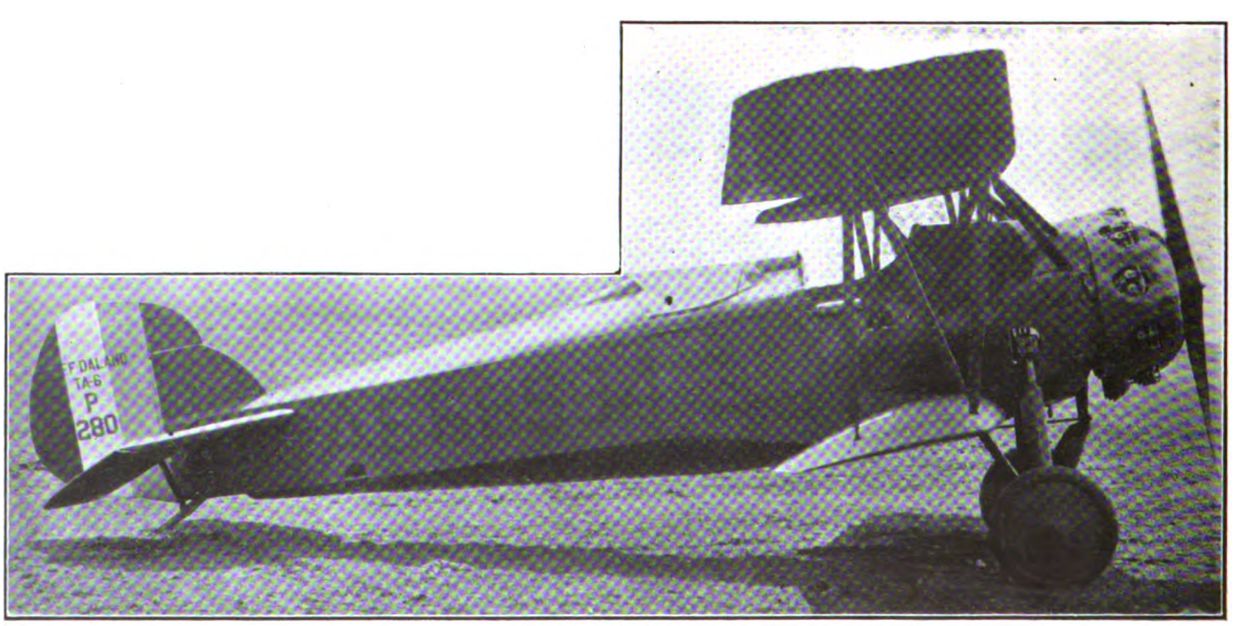
HUFF-DALAND—*continued.*



The "Petrel" Model 4 is a three-seater, with two passengers in the forward cockpit, where dual engine and flying controls are installed, but the rudder bar and stick can be removed and the opening in the floor sealed by an aluminium plate. The TW-5, TA-6 and HN-2, being training planes, are two-seaters and have a narrower fuselage.

Specification of the Huff-Daland "Petrel 4."

Seats	**3.**
Span, upper	**29 ft. 4 in. (8.95 m.).**
Span, lower	**23 ft. 8 in. (7.22 m.).**
Length	**24 ft. (7.32 m.).**
Engine	**220 h.p. Wright E-4.**
Weight empty	**1,475 lbs. (668 kgs.).**
Weight loaded	**2,375 lbs. (1,077 kgs.).**
Performance.	
High speed	115 m.p.h. (169 km.h.).
Low speed	40 m.p.h. (64 km.h.).
Climb.	
To 10,000 ft. (3,050 m.)	23 mins.
Cruising range	300 miles at 90 m.p.h. (485 km. at 145 km.h.).



The Huff-Daland T.A.6 (200 h.p. Wright radial engine).

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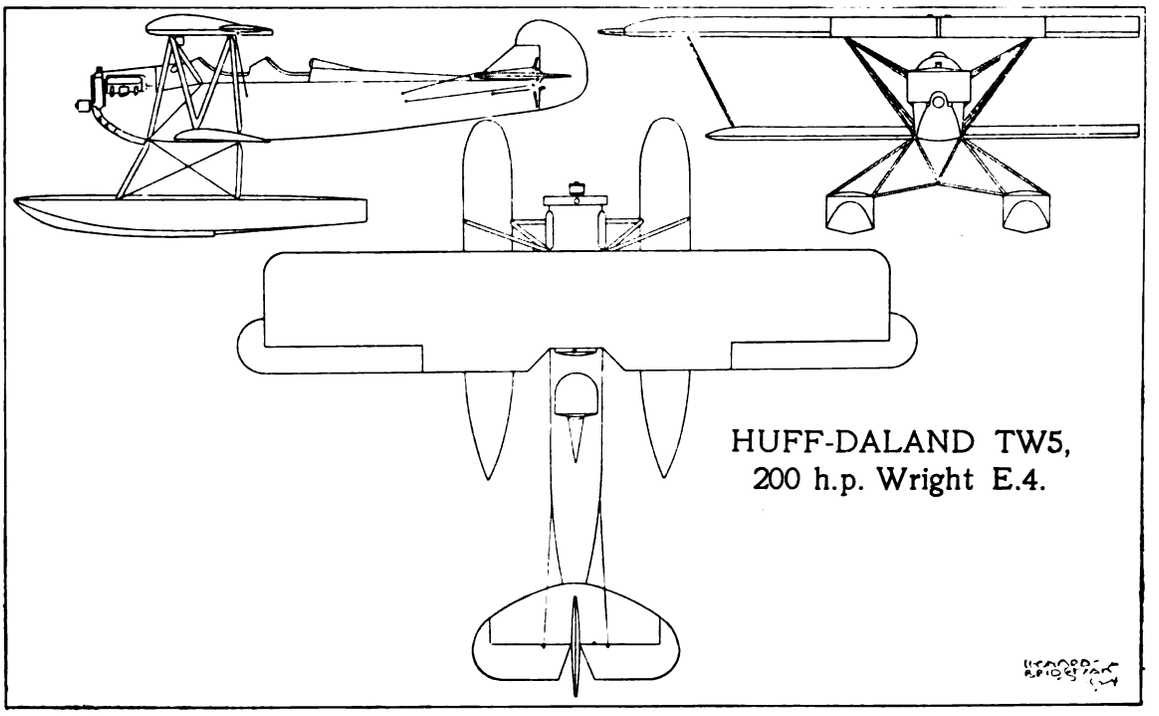
HUFF-DALAND—*continued.*



I

IRWIN.

Irwin Aircraft Company, Sacramento, California.

This firm built, during 1922, a small single-seater sport aeroplane of conventional design which is simple enough to enable enthusiastic amateurs to build it from blue prints which the Company supplies upon demand. A specification was given in the previous volume.

J

JOHNSON.

Johnson Airplane and Supply Company. Offices and Factory : Dayton, Ohio.

This firm built in 1923 a well-streamlined Johnson-Hartzell tractor biplane around the 90 h.p. Curtiss OX-5 engine, which is shown in the accompanying photograph. Walter E. Lees won on this machine the Flying Club of St. Louis Trophy race (open for two-seaters of 90 h.p. maximum power) at an average speed of 89.5 m.p.h. (144 km.h.).

The Johnson Hartzell Biplane (90 h.p. Curtiss OX-5 engine).

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L

LAIRD.

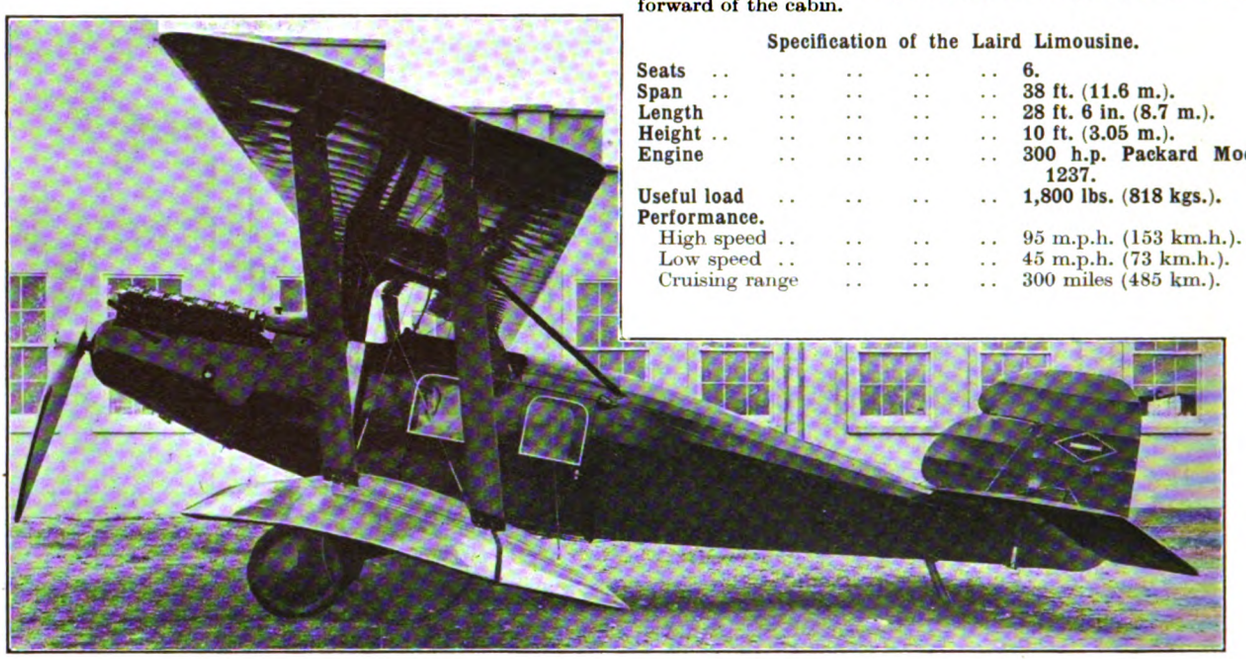
E. M. Laird Company, Wichita, Kansas.

Mr. Laird in 1923 sold his interest and goodwill in the Laird Company to J. M. Mollendick, who incorporated a new firm under the title "Swallow Aeroplane Manufacturing Company," of which he is the President. (See under Swallow.)

The last product of the Laird Company is the Laird Limousine, a six-seater commercial tractor biplane with the 300 h.p. Packard Model 1237 engine. Constructionally, this machine is of conventional design, with wings and fuselage built up on wire-braced wooden frames. The engine is mounted on a steel tube mounting, which can be removed by undoing four bolts. Accommodation for four passengers is provided in the cabin, while a fifth passenger may sit alongside the pilot, in the cockpit forward of the cabin.

Specification of the Laird Limousine.

Seats	**6.**
Span	**38 ft. (11.6 m.).**
Length	**28 ft. 6 in. (8.7 m.).**
Height	**10 ft. (3.05 m.).**
Engine	**300 h.p. Packard Model 1237.**
Useful load	**1,800 lbs. (818 kgs.).**
Performance.	
High speed	95 m.p.h. (153 km.h.).
Low speed	45 m.p.h. (73 km.h.).
Cruising range	300 miles (485 km.).



The Laird Limousine (300 h.p. Packard engine).

LINCOLN.

Lincoln-Standard Aircraft Corporation, Loncoln, Nebraska.

President : Ray Page.

This Company produced in 1923, to the designs of W. O. Timm, then its Chief Engineer, a new commercial aeroplane called Model LS-5. This is a tractor biplane with the 180 h.p. Hispano-Suiza engine, and seats four passengers in a semi-enclosed cockpit situated in front of the pilot's cockpit. The construction is conventional, wire-braced wooden frames being used in the wings, fuselage and tail surfaces. The landing gear is of steel tubing. The engine compartment is particularly accessible. The cooling system consists of two side radiators with an expansion tank mounted between the cylinder blocks. A booster magneto is provided for the starting of the engine.

Specification of the Lincoln-Standard Model LS-5.

Seats	**5.**
Span, top	**44 ft. 7 in. (13.6 m.).**
Span, bottom	**32 ft. (9.76 m.).**
Chord	**6 ft. (1.83 m.).**
Wing area	**447 sq. ft. (41.5 m.).**
Engine	**180 h.p. Hispano-Suiza.**
Weight empty	**1,735 lbs. (787 kgs.).**
Weight loaded	**2,922 lbs. (1,330 kgs.).**
Performance.	
High speed	92 m.p.h. (148 km.h.).
Low speed	34 m.p.h. (53 km.h.).
Climb.	
To 5,200 ft. (1,590 m.)	10 mins.
Ceiling	18,000 ft. (5,500 m.).
Range	310 miles (500 km.).

The Lincoln Standard L.S.5 (180 h.p. Hispano-Suiza engine).

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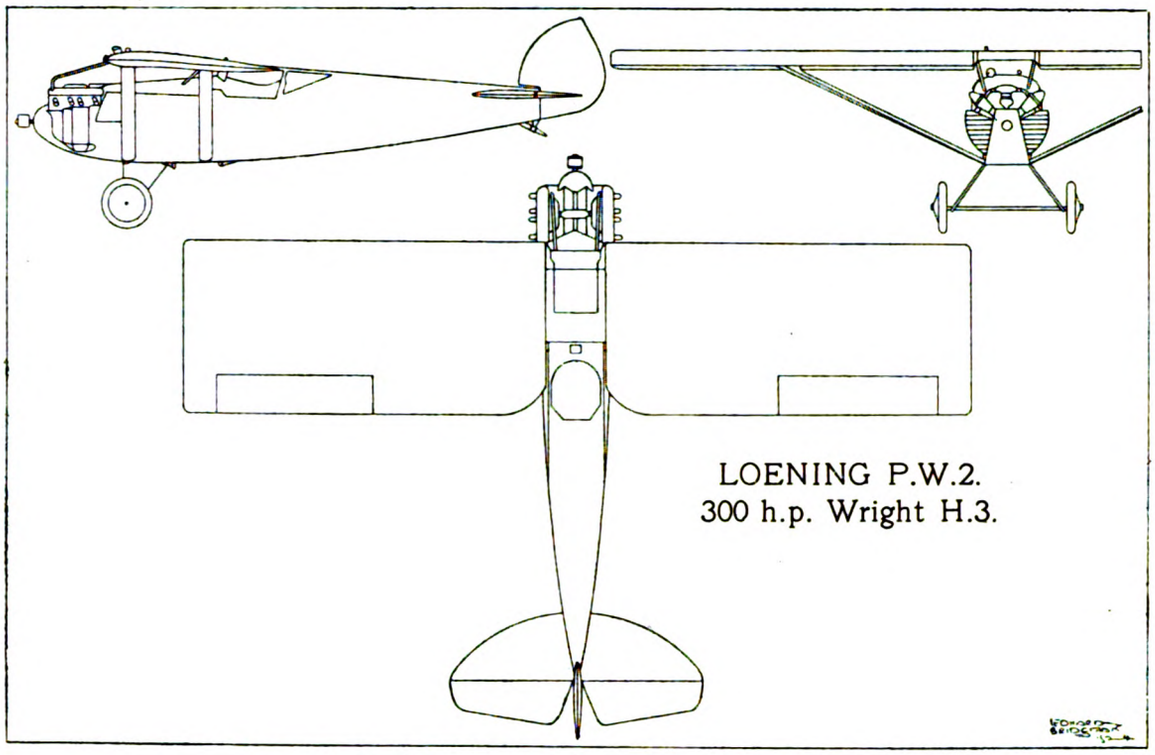
LOENING.



The Loening Aeronautical Engineering Corporation, 420-428, East 31st Street, New York.

The Loening Company produced in 1923 eight of its well-known Air Yacht flying-boats for the U.S. Army Air Service, where they are intended for communication service in the island possessions. Three flying-boats of the same type, but specially equipped for Civil Aerial Transport, were built for the New York-Newport Air Line, Inc., of which an account will be found in the Historical Section.

In addition, the Loening Company built an experimental Pursuit Aeroplane, Type PW-2, which is under test by the Air Service Engineering Division at McCook Field. This machine is a further refinement of the Loening Strut-braced Monoplane, described in the 1922 issue of "All the World's Aircraft." The span is 34 ft. 11 in. (10.65 m.), the overall length 25 ft. 11 in. (7.9 m.), the overall height 8 ft. 3 in. (2.52 m.). The designed performance is a high speed of 140 m.p.h. (226 km.h.) and a climb of 10,000 ft. (3,000 m.) in 9 mins. The engine is a 300 h.p. Wright Model H.

LONGREN.

Longren Aircraft Corporation, Topeka, Kansas.

The U.S. Navy Department has placed an order with the Longren Company for the construction of three experimental aeroplanes with the 60 h.p. Wright Radial engine, which will incorporate the moulded fibre fuselage used on the Longren Model AK Sport Aeroplane. (See "All the World's Aircraft, 1922.") The interest of the Navy lies in the fact that this fibre fuselage may be manufactured in large quantities at very small cost, and also in that such a fuselage is extremely light and strong.

In the construction of this fuselage the fibre is compressed into sheets and the fuselage sections are stamped out.

L.W.F.

L.W.F. Engineering Corporation, College Point, Long Island, N.Y.

The L.W.F. Company, having completed the Government contracts for thirty-five Martin Bombers, twenty Douglas Torpedo Planes and twenty-six Naval Observation Planes, produced for the Army Air Service the Model T-3, "Liberty"-engined Transport Aeroplane.

THE L.W.F. T-3.

The Model T-3 is a tractor biplane fitted with the 400 h.p. "Liberty" engine, and accommodates six passengers in a cabin in addition to a crew of two and baggage. The fuselage is of welded steel tubing, covered with fabric. The wings are of conventional wooden truss design. The machine is primarily intended for Army transport work, but it can easily be converted into a bomber. The pay load is approximately one ton.

Longren Biplane (60 h.p. Wright).

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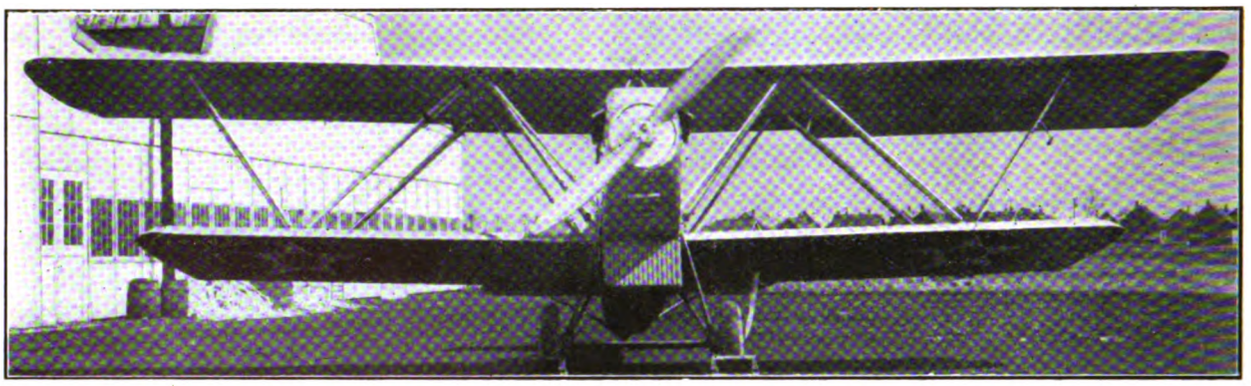
M



The Martin M20-1 Spotter as a land machine (400 h.p. Curtiss D12 engine).

GLENN MARTIN.

The Glenn L. Martin Company, Cleveland, Ohio.

During 1923 the Glenn Martin Company produced for the U.S. Naval Air Service, thirty MO-1 Observation Planes (see "All the World's Aircraft, 1923"), which type is being issued as the new Service equipment to the Observation Plane Squadrons of the Navy. An experimental biplane version of this type, the M2O-1, was produced during the year.

THE MARTIN M2O-1.

A biplane spotter with the Curtiss D-12 engine, built as a seaplane, but can be fitted with an interchangeable land undercarriage.

Performance.

Max. speed	**110 m.p.h. (177 km.h.).**
Min. speed	**52 m.p.h. (83 km.h.).**
Climb.	
To 5,000 ft. (1,525 m.)	10 mins.
Ceiling	14,000 ft. (4,600 m.).

THE GLENN MARTIN MAIL AEROPLANE.

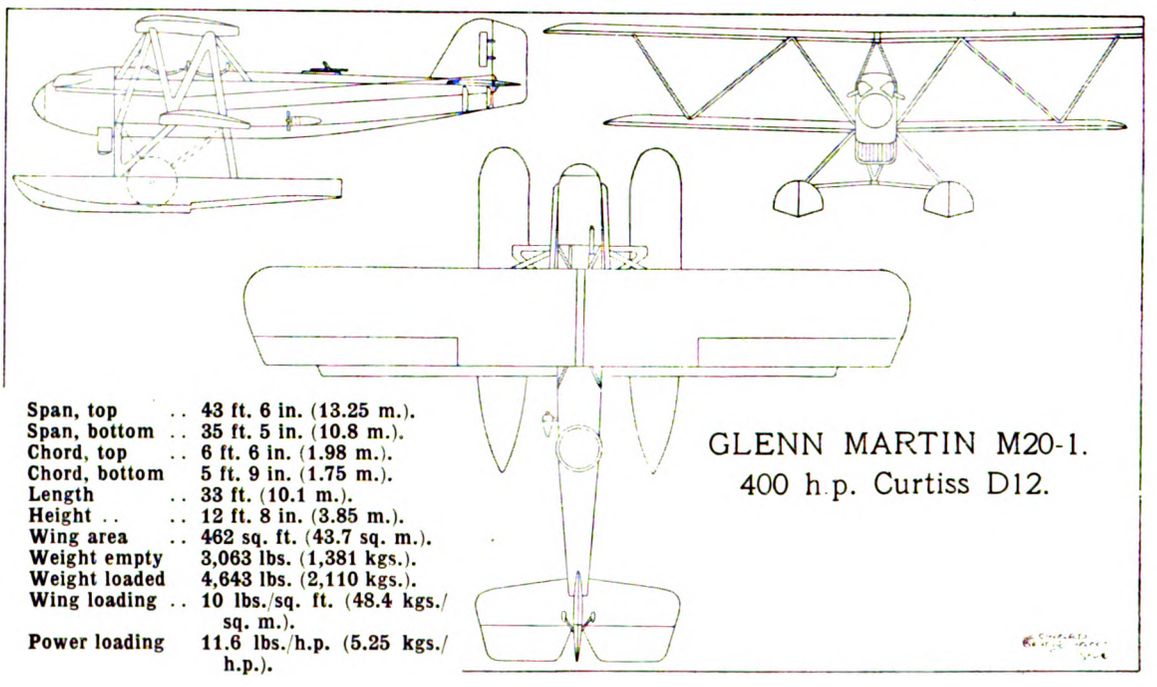
The Glenn Martin Mail Aeroplane was specially developed for the night flying experiments of the U.S. Air Mail Service as machine offering maximum safety to the pilot and great economy in operation. Low landing speed and very rugged construction, to withstand rough landings in the darkness, simplicity of design and a large amount of inherent stability are some of the features of this machine. The flying trials have amply demonstrated these qualities, while the machine has also demonstrated its ability to execute acrobatic manœuvres with ease and accuracy. It was found impossible to put the machine in a spin, and in stalls there was no tendency to side slip.

It is a tractor biplane fitted with the 200 h.p. Wright E-4 engine. The construction is of conventional wooden truss design. The fuselage is of the four longeron type, with veneer sides. The pilot sits in a roomy cockpit, about midway in the fuselage, where he is far removed from immediate contact with the ground in case of a crash. The mail compartment, of 31 cu. ft. capacity, is situated in front of the cockpit and holds about 600 lbs. of pouched mails. Below the mail compartment are two petrol tanks with a combined capacity of 64 galls., which give the machine a cruising range of 6 hours.

The engine is supported on ash bearers on a steel tube mounting. The radiator is directly below the engine and is completely cowled in except for the cooling surface. The radiator shutter is a novel trap door arrangement with a positive rack-and-pinion control in the cockpit. The radiator is so located that in case the machine noses over it cannot come in contact with the ground. A five-gallon oil tank is located on the front bulkhead, at the rear and below the engine, and an oil radiator is installed underneath.

The wings have box type beams and built-up spruce ribs with plywood sides. The top wing is in three sections, there being a small centre section. The cabane consists of two "picture frame" struts, of laminated wood. The interplane struts are of "hour glass" shape, built up on the "N" strut principle and covered with plywood. Ailerons are carried on both wings, the top ones being counter-balanced by wind vanes.

The undercarriage consists of three Vees of welded steel tubing, with a centrally hinged axle and rubber sprung wheels. A high load factor has been given the undercarriage to withstand rough landings.



GLENN MARTIN M20-1.
400 h.p. Curtiss D12.

Span, top	**43 ft. 6 in. (13.25 m.).**
Span, bottom	**35 ft. 5 in. (10.8 m.).**
Chord, top	**6 ft. 6 in. (1.98 m.).**
Chord, bottom	**5 ft. 9 in. (1.75 m.).**
Length	**33 ft. (10.1 m.).**
Height	**12 ft. 8 in. (3.85 m.).**
Wing area	**462 sq. ft. (43.7 sq. m.).**
Weight empty	**3,063 lbs. (1,381 kgs.).**
Weight loaded	**4,643 lbs. (2,110 kgs.).**
Wing loading	**10 lbs./sq. ft. (48.4 kgs./sq. m.).**
Power loading	**11.6 lbs./h.p. (5.25 kgs./h.p.).**

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GLENN MARTIN—*continued.*

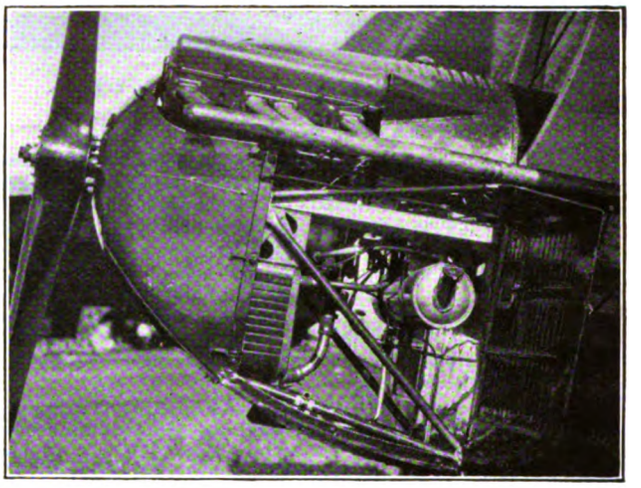
The Glenn Martin Mail Plane (200 h.p. Wright E4 engine).

The controls are of particular interest in that not a single pulley occurs in the whole system. Every cable runs in a straight line to the control surfaces, and are operated by levers and bell cranks.

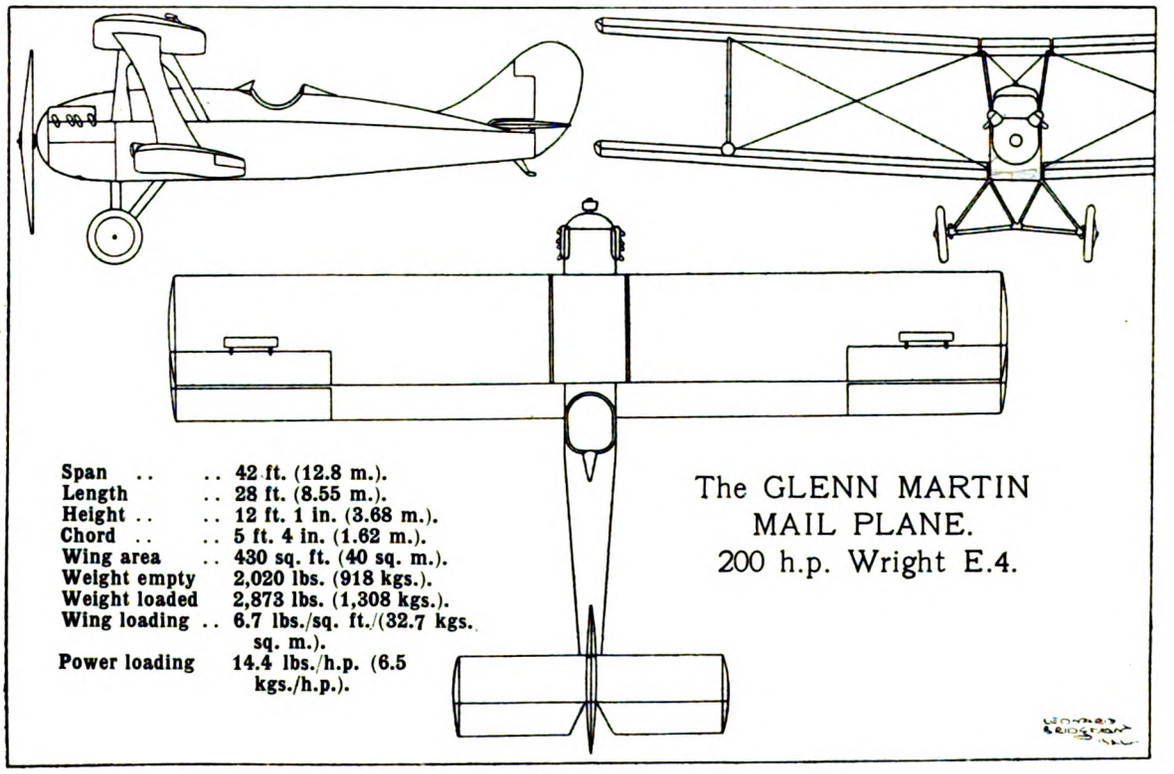
The tail skid is steerable.

Performance of the Glenn Martin Mail Aeroplane.

High speed	105 m.p.h. (169 km.h.).
Low speed	38 m.p.h. (61 km.h.).
Climb.	
To 6,000 ft. (1,830 m.)	11 mins.
Range, cruising	500 miles (800 km.).



Engine Mounting of the Martin Mail Plane.



Span	**42 ft. (12.8 m.).**
Length ..	**28 ft. (8.55 m.).**
Height	**12 ft. 1 in. (3.68 m.).**
Chord	**5 ft. 4 in. (1.62 m.).**
Wing area ..	**430 sq. ft. (40 sq. m.).**
Weight empty	**2,020 lbs. (918 kgs.).**
Weight loaded	**2,873 lbs. (1,308 kgs.).**
Wing loading ..	**6.7 lbs./sq. ft./(32.7 kgs. sq. m.).**
Power loading	**14.4 lbs./h.p. (6.5 kgs./h.p.).**

The GLENN MARTIN
MAIL PLANE.
200 h.p. Wright E.4.

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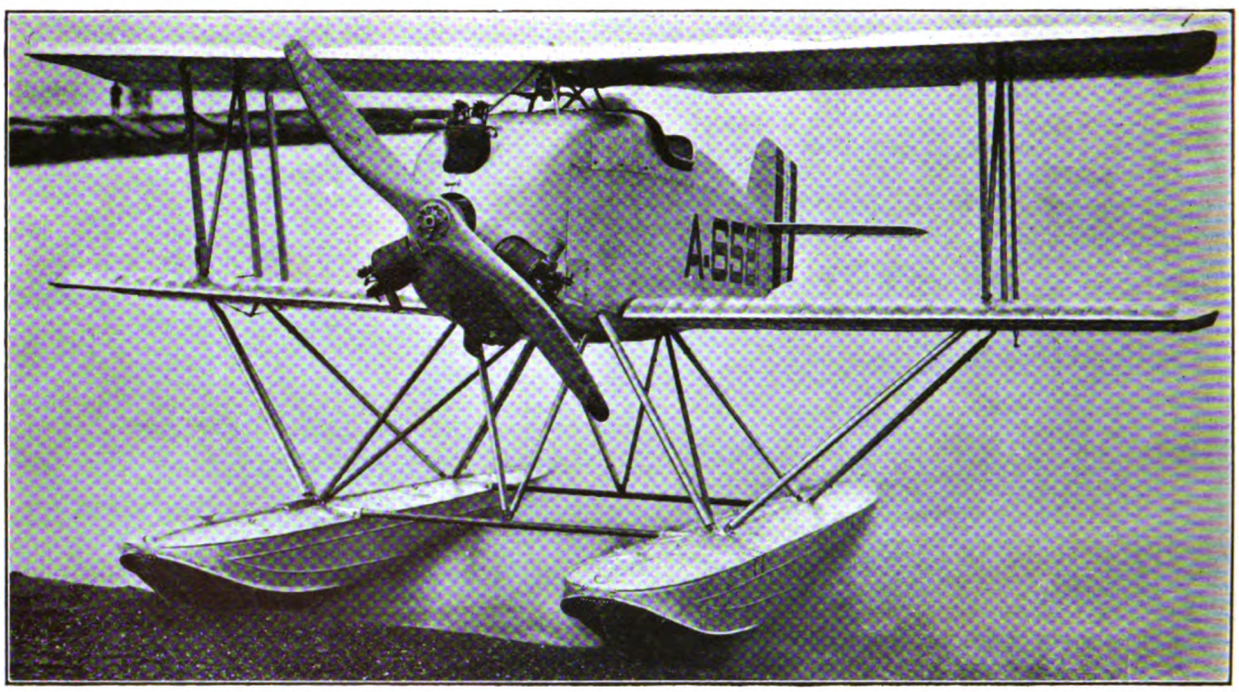
GLENN MARTIN—*continued.*



The Martin MS-1 Seaplane (60 h.p. Wright engine).

GLENN MARTIN MODEL MS-1 PLANE.

A small Submarine Scout Plane was also built for the Naval Air Service. This machine, Type MS-1, is a single-seater one-bay tractor biplane fitted with the 60 h.p. Wright Radial engine and with twin floats.

The fuselage is entirely built of welded steel tubing, with the fittings attached by "rosette welding," a process developed in the Martin factory. This consists in drilling holes through both the main members and fittings, and torch welding the material around the radius of the holes. Tests on this type of construction have shown exceptional strength, while it also allows for a minimum of weight.

The frames of the wings and tail surfaces are built up of channel section duralumin sheet, while the ribs are stamped out of this alloy in one piece. Two-inch duralumin tubes are used as wing spars. The wings, fuselage and tail surfaces are covered with fabric. The interplane bracing consists of "N" struts.

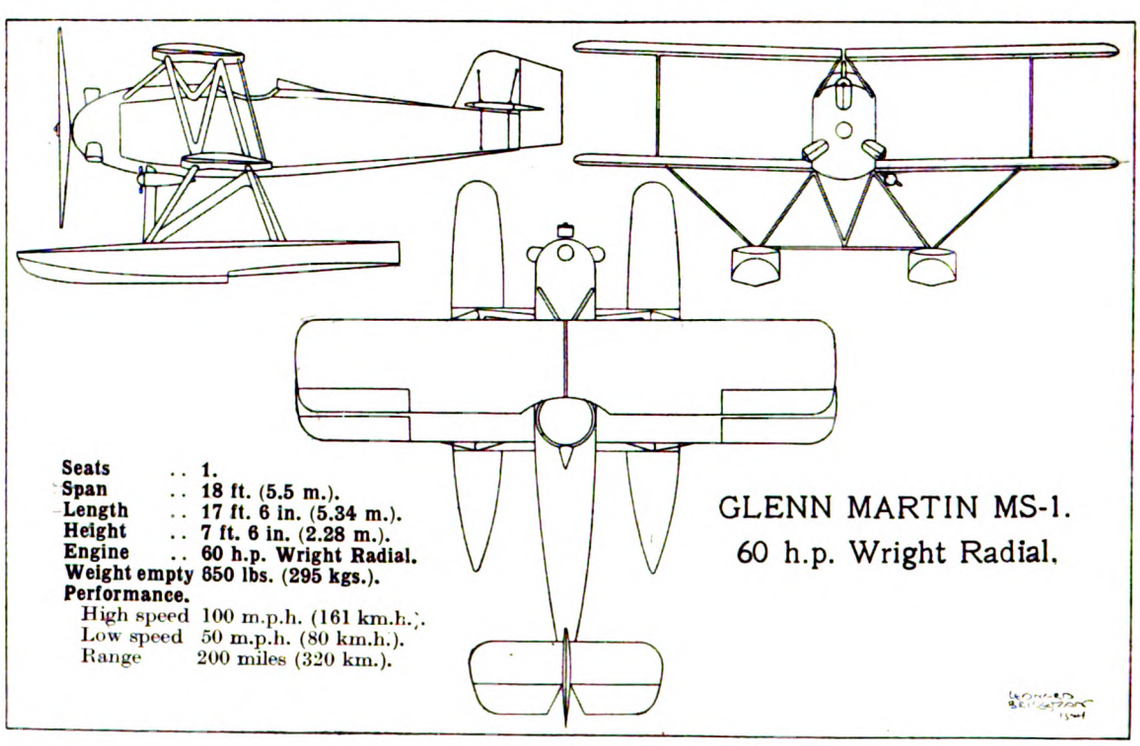
The two floats are built entirely of duralumin, with channel section bracing members and watertight bulkheads. All exposed struts are faired with sheet duralumin.

Special provision was made in the design of the MS-1 to permit of its being quickly assembled and dismantled in case it is desired to stow the machine in a very small space, such as on board a submarine.

THE MARTIN MODEL 67 TRAINING MACHINE.

A tractor biplane which can be fitted with either wheels or a single central float, for use in elementary training. It is fitted with a 9-cylinder radial aircooled engine and has tandem seats with dual controls.

Construction of the so-called Martin Super-Bomber, which was to be fitted with two 700 h.p. McCook Field Model W-1A engines, has been stopped, owing to a change in the policy of the U.S. Army Air Service with regard to Night Bombers.



Seats .. 1.
Span .. 18 ft. (5.5 m.).
Length .. 17 ft. 6 in. (5.34 m.).
Height .. 7 ft. 6 in. (2.28 m.).
Engine .. 60 h.p. Wright Radial.
Weight empty 650 lbs. (295 kgs.).
Performance.
High speed 100 m.p.h. (161 km.h.).
Low speed 50 m.p.h. (80 km.h.).
Range 200 miles (320 km.).

GLENN MARTIN MS-1.
60 h.p. Wright Radial.

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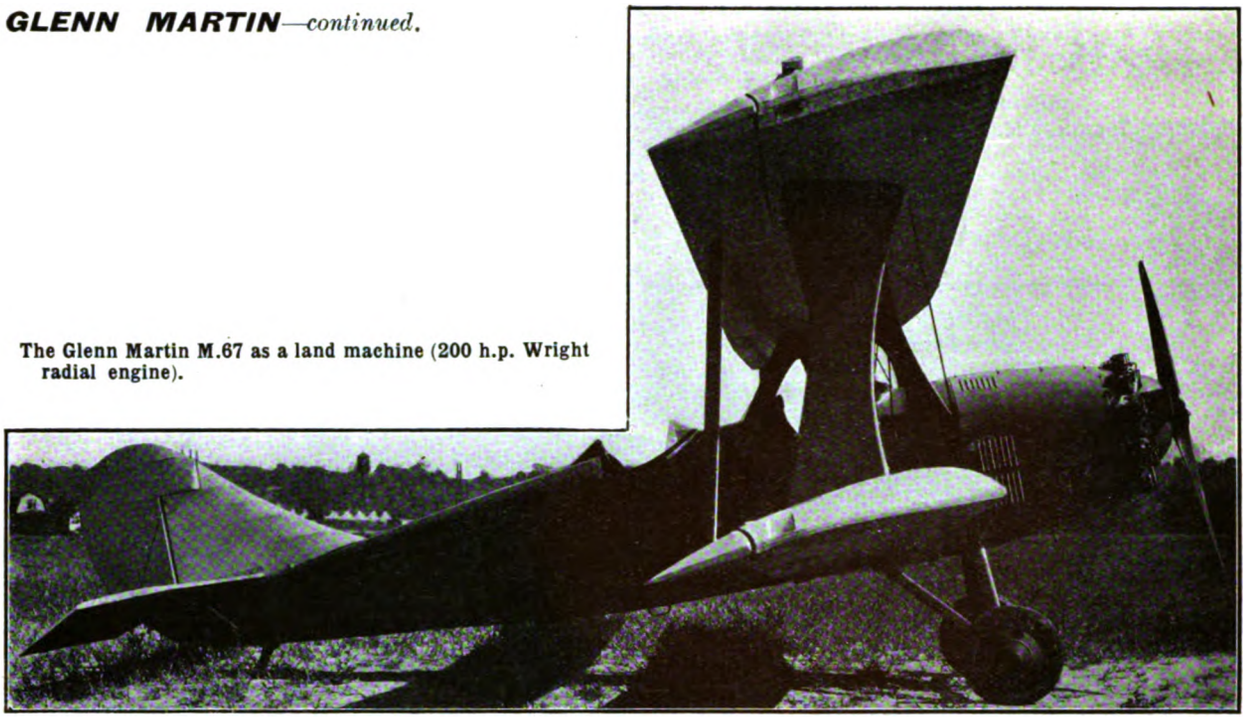
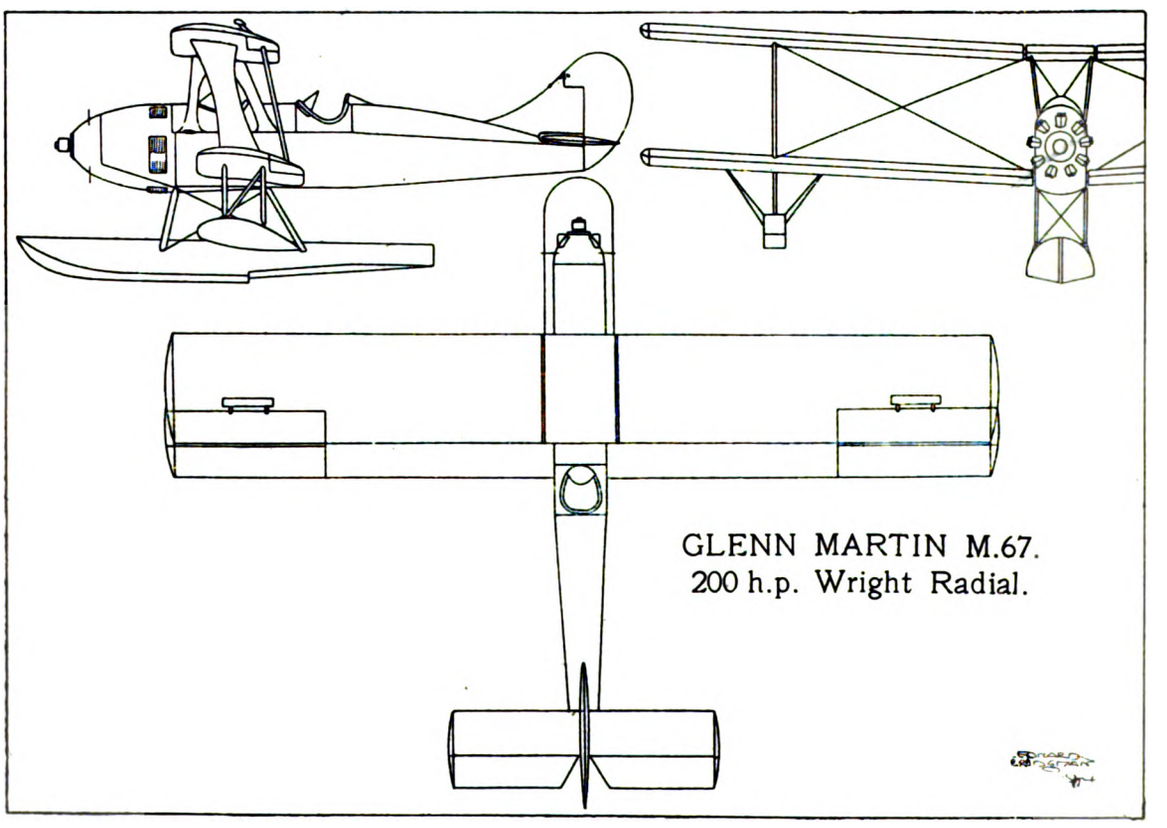
GLENN MARTIN—*continued.*



The Glenn Martin M.67 as a land machine (200 h.p. Wright radial engine).

Specification of the Model 67.

Span	**42 ft. (12.8 m.).**
Length (land)	**27 ft. 10 in. (8.47 m.).**
Length (seaplane)	**31 ft. 2 in. (9.52 m.).**
Chord	**5 ft. 4 in. (1.62 m.).**
Wing area	**430 sq. ft. (40 sq .m.).**
Engine	**200 h.p. Wright J.**
Weight empty (land)	**1,937 lbs. (880 kgs.).**
Weight empty (seaplane)	**2,091 lbs. (950 kgs.).**
Weight loaded (land)	**2,550 lbs. (1,160 kgs.).**
Weight loaded (seaplane)	**2,704 lbs. (1,245 kgs.).**
Performance of land machine at 2,575 lbs. (1,170 kgs.) total load.	
Max. speed	112 m.p.h. (180 km.h.).
Min. speed	39 m.p.h. (63 km.h.).
Climb.	
To 7,600 ft. (2,320 m.)	10 mins.
Ceiling	19,000 ft. (5,800 m.).



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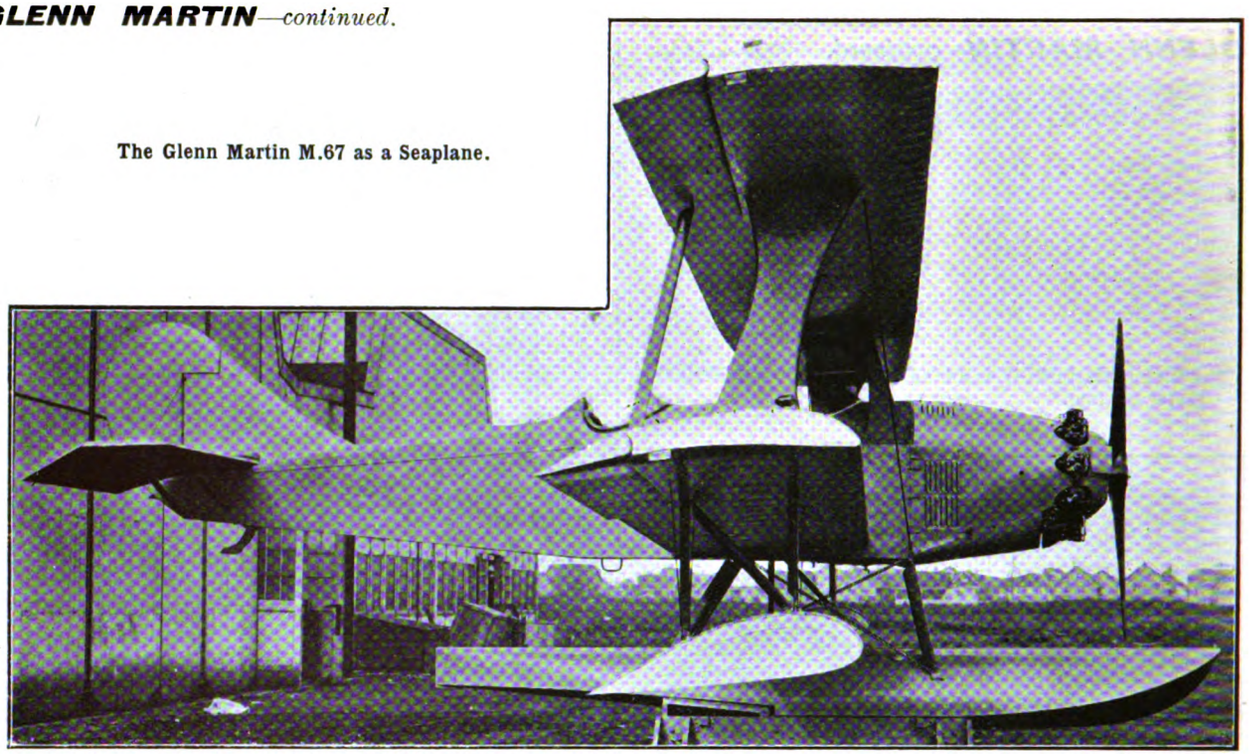
GLENN MARTIN—*continued.*

The Glenn Martin M.67 as a Seaplane.



J. V. MARTIN.

[Not communicated by Mr. D'Orcy.—Ed.]

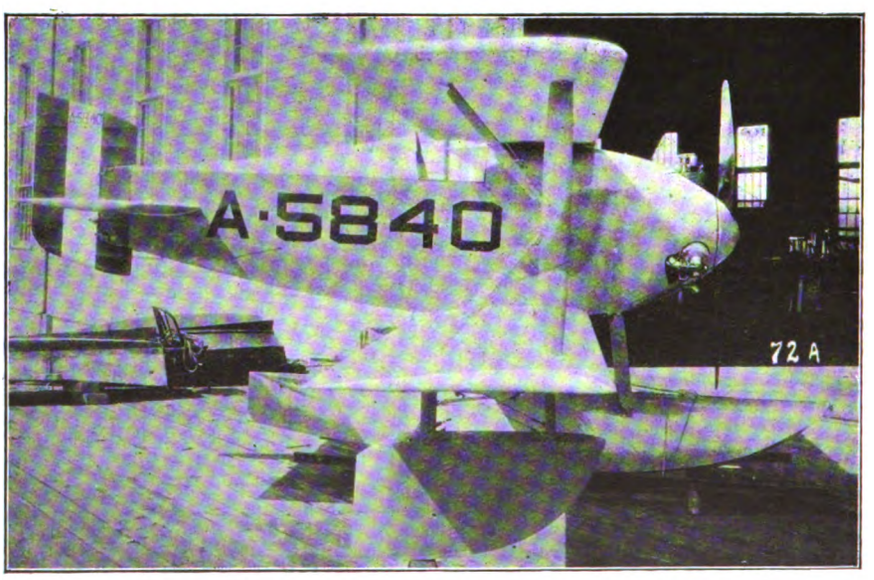
Martin Aeroplane Factory, Garden City, New York.

Capt. Jas. V. Martin continues to design and to conduct propaganda in favour of the use of retractable undercarriages, both wheel and float. Has designed a novel and ingenious landing-wheel for aircraft, and carried on a vigorous campaign of litigation against the Aircraft Manufacturers' Association.

In his spare time, he had been able to design and build the little single-float seaplane, fitted with a 3-cylinder Lawrance engine of 60 h.p., which is illustrated.

This machine has been built for the U.S. Navy for purposes analogous to those for which the Army uses the Sperry "Messenger."

Capt. James V. Martin brought, in 1923, a law suit against every aircraft manufacturer in the United States who is a member of the Manufacturers' Aircraft Association, claiming $51,000,000 damages for infringement of patents, unlawful competition and restraint, etc. The suit was thrown out of Court.



The J. V. Martin Seaplane (60 h.p. Lawrance engine).

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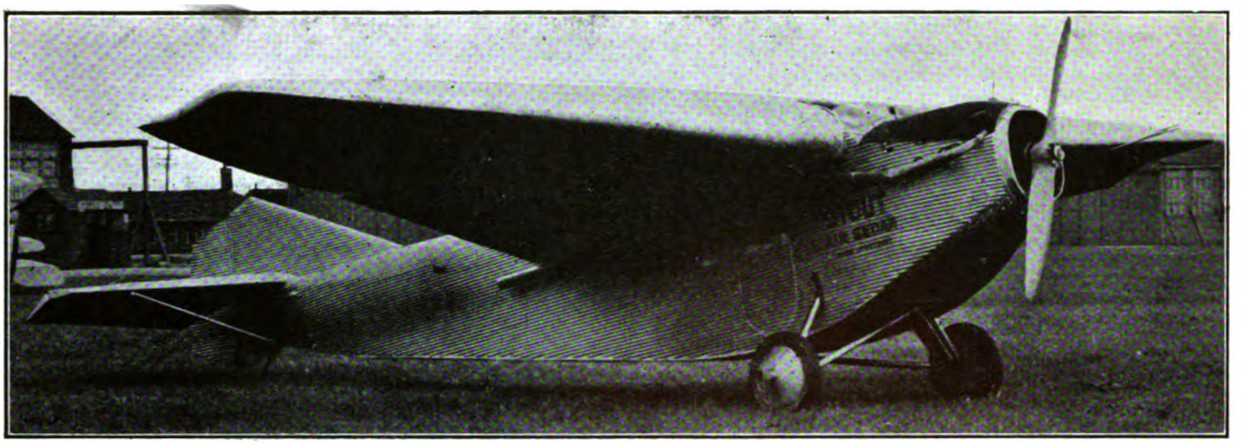
STOUT.



A Stout all metal Passenger Carrier.

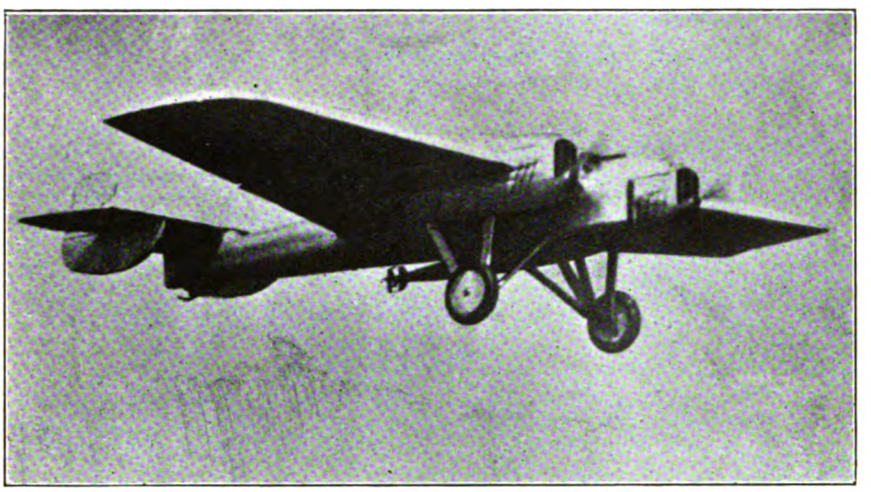
Stout Metal Aeroplane Company, Detroit, Mich.

Chief Engineer: William B. Stout.

The title of this firm is now as recorded above.

As some of the most prominent motor car manufacturers of Detroit—Mr. Edsel Ford, among others—are members of the Board of Governors of this firm, it may be considered as a sort of aeronautical workshop of these big interests. Their concern with civil aviation, and with all-metal aeroplane construction, in particular, is at any rate highly significant, and so is the fact that little reliable information can be had of their activities.

During 1923, Mr. Stout is understood to have further pursued the development of his cantilever metal monoplane, the newest model of which is equipped with the 400 h.p. "Liberty" engine.



A Stout all metal Torpedo Carrier (2—400 h.p. Liberty engines.)

Specifications of the Stout Air Pullman.

Span	**60 ft. (18.3 m.).**
Overall length	**45 ft. (13.7 m.).**
Chord (mean)	**10 ft. (3.05 m.).**
Total wing area	**600 sq. ft. (55.8 sq. m.).**
Engine	**400 h.p. "Liberty."**
Weight loaded	**5,400 lbs. (2,460 kgs.).**
Useful load	**2,379 lbs. (1,080 kgs.).**
Cargo space	**231 cu ft. (6 m³.).**
No. passenger accommodations	**Pilot and 7.**
Performance.	
High speed (estimated)	120 m.p.h. (193 km.h.).
Low speed	54 m.p.h. (87 km.h.).
Climb.	
Service ceiling	15,600 ft. (4,750 m.).
Endurance	4½ hours.

SWALLOW.

Swallow Aeroplane Manufacturing Company. Head Offices and Factory: Wichita, Kansas. President: J. M. Mollendick. Vice-President and General Manager: Walter H. Beach. Secretary and Treasurer: Randall Myers. Chief Engineer: Lloyd Stearman.

The Swallow Company are the successors to the E. M. Laird Company (see under Laird). Their first product is the Model 1924 Swallow Commercial Three-seater, a refinement of the Laird Swallow, built around the 90 h.p. Curtiss OX-5 engine. This machine has achieved considerable popularity in the Middle West for passenger carrying work.

SWALLOW MODEL 1924 THREE-SEATER.

The Swallow Model 1924 is a tractor biplane of conventional construction, which embodies many desirable commercial features, such as small dimensions, sturdiness, low initial cost and very low maintenance cost, together with a good all-round performance.

The fuselage is of the stick and wire type, with a detachable steel tube engine mounting, and a well-streamlined nose. The

The 1924 Swallow. (90 h.p. Curtiss OX-5 engine.)

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SWALLOW—*continued.*

passengers' cockpit seats two persons abreast in very comfortable and roomy seats. The pilot's cockpit is located right behind. The radiator is swung below the fuselage and weighs only 27 lbs. The entire cooling system holds only 4 galls. (U.S.) of water, and yet cools sufficiently on the hottest days. An aluminium fuel tank of 33 galls. capacity is mounted in the fuselage, together with a reserve tank of 4 galls., which gives the pilot half an hour's flying after he has exhausted the main tank.

The wings are of orthodox wood and wire construction, with ailerons on both top and bottom panels. The tail surfaces are built of wood and metal, the elevator and rudder having steel ribs and duralumin trailing edges, while the tail plane has a wooden frame.

The landing gear is of the "split-axle" type, and is made of steel tubing, with rubber sprung wheels. The propeller has a ground clearance of 20 in.

Specification of the Swallow Model 1924.

Seats	**3.**
Span	**32 ft. (9.76 m.).**
Chord	**5 ft. (1.52 m.).**
Wing area	**300 sq. ft. (28 sq. m.).**
Engine	**90 h.p. Curtiss OX-5.**
Weight empty	**1,250 lbs. (568 kgs.).**
Weight loaded	**1,950 lbs. (887 kgs.).**
Performance.	
High speed	95 m.p.h. (153 km.h.).
Low speed	35 m.p.h. (56 km.h.).
Ceiling	18,000 ft. (5,500 m.).
Endurance	4 hours full speed.

SWANSON.

S. S. Swanson, Vermillion, South Dakota.

Mr. Swanson, an amateur builder, produced, with E. W. Freeman, in 1923, an improved model of his Sport Aeroplane, which was described in last year's issue of "All the World's Aircraft."

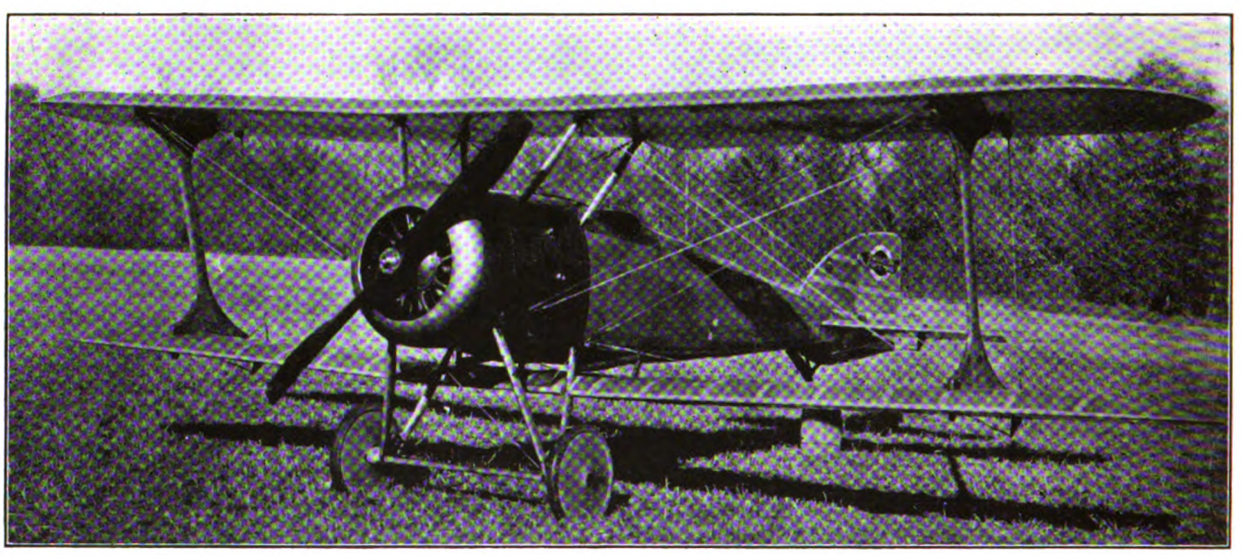
Constructionally, the new model, SS-4, offers little of interest, for it only incorporates well-known and well-tried ideas of aeroplane design. It is only when one comes to consider the performance of this little machine that the cleverness of the design is fully appreciated.

The fuselage is a wooden wire-trussed girder, covered with fabric. An 80 h.p. Le Rhône engine is mounted on a nose plate, and behind, just over the C.G., there is a petrol tank giving three hours' flight and an oil tank of 10 galls. capacity. Behind, two seats are arranged side-by-side.

The wings are built in six units, with two centre sections, the bottom wing passing under the fuselage. Top and bottom wings are interchangeable, both carrying ailerons. The interplane truss is of clean design, with a single laminated "I" strut on either side of the fuselage. The wings and tail surfaces have wooden frames and fabric covered.

Specification of the Swanson-Freeman SS-4.

Seats	**2.**
Span	**28 ft. (8.54 m.).**
Length	**21 ft. 7 in. (6.59 m.).**
Height	**8 ft. 6 in. (2.59 m.).**
Chord	**4 ft. 4 in. (1.32 m.).**
Wing area	**225 sq. ft. (21 sq. m.).**
Engine	**80 h.p. Le Rhone.**
Weight empty	**980 lbs. (446 kgs.).**
Weight loaded	**1,550 lbs. (705 kgs.).**
Performance.	
High speed	95 m.p.h. (153 km.h.).
Low speed	35 m.p.h. (56 km.h.).
Climb.	
To 800 ft. (240 m.)	1 min.



The Swanson Freeman SS-4 (80 h.p. Le Rhône engine).

T

THOMAS-MORSE.

Thomas-Morse Aircraft Corporation, Ithaca, New York.

The Thomas-Morse Company built for the 1922 Pulitzer Race, to the order of the Army Air Service, two racing aeroplanes which were fitted with the Packard "2025" 600 h.p. engine. This type, called TM-22, is an all-metal version of the MB-7 which participated in the 1921 Pulitzer Race. Like the latter, it is a raised wing or "parasol" monoplane which carries the fuel tank in the centre section. The wings are of tapering section. The wings and the fuselage are built up duralumin channel members, the only use of steel occurring in the engine bearers. The covering of wings and fuselage is of corrugated duralumin sheet, like on the Junkers monoplanes.

During 1923, two military adaptations of the Model TM-22 Racing Aeroplane, which was built for the 1922 Pulitzer Trophy race, were produced by the Thomas-Morse Company. One of these machines is the Model MB-9, a Pursuit Aeroplane with the 300 h.p. Wright Model H-3 engine; the other is the Model MB-10 Training Aeroplane with the 110 h.p. Le Rhône engine. Both machines are entirely built of metal, and embody the features the TM-22, described in last year's issue of "All the World's Aircraft." That is to say, the framework of the fuselage and of the wings are duralumin channel members, while the covering is of corrugated sheet duralumin, as on the Junkers monoplanes.

The Model MB-9 measures 29 ft. (8.74 m.) in span and 19 ft. (5.8 m.) in length. It has a speed range of 65-170 m.p.h. (105-275 km.h.).

The Model MB-10 is 29 ft. (8.74 m.) in span and 21 ft. (6.4 m.) long, with a speed range of 50-105 m.p.h. (80-170 km.h.) and a climb in 10 mins. of 5,000 ft. (1,500 m.).

The firm have also produced a side-by-side training machine, the specification of which is given.

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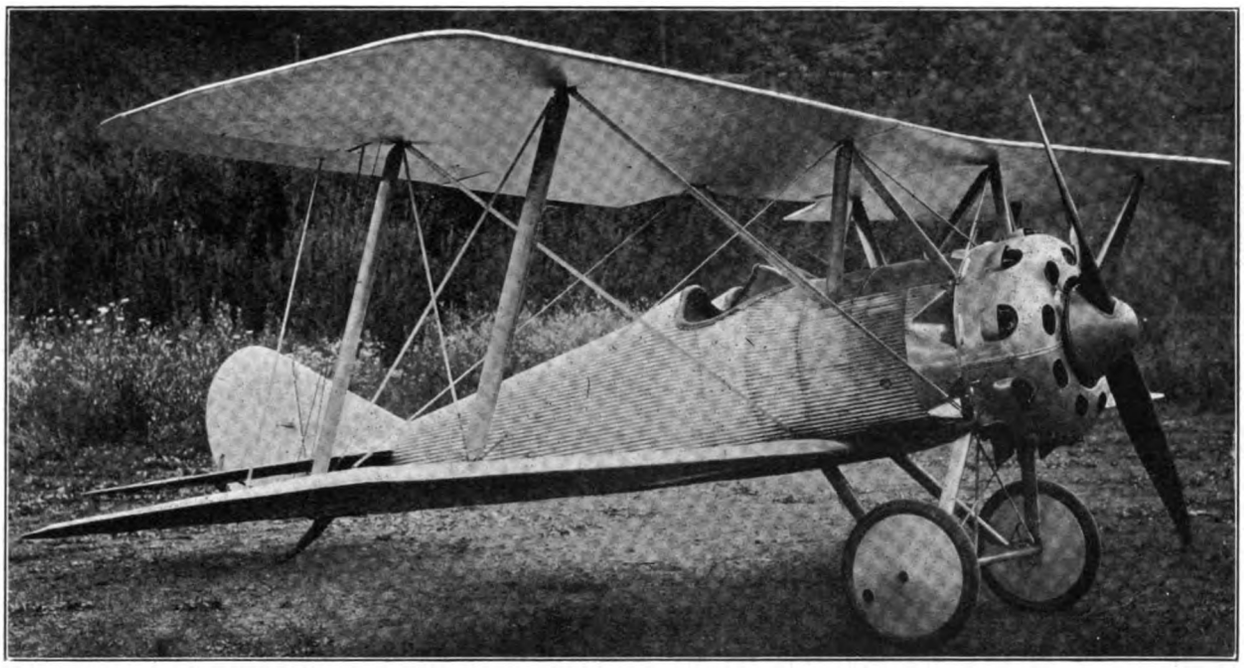
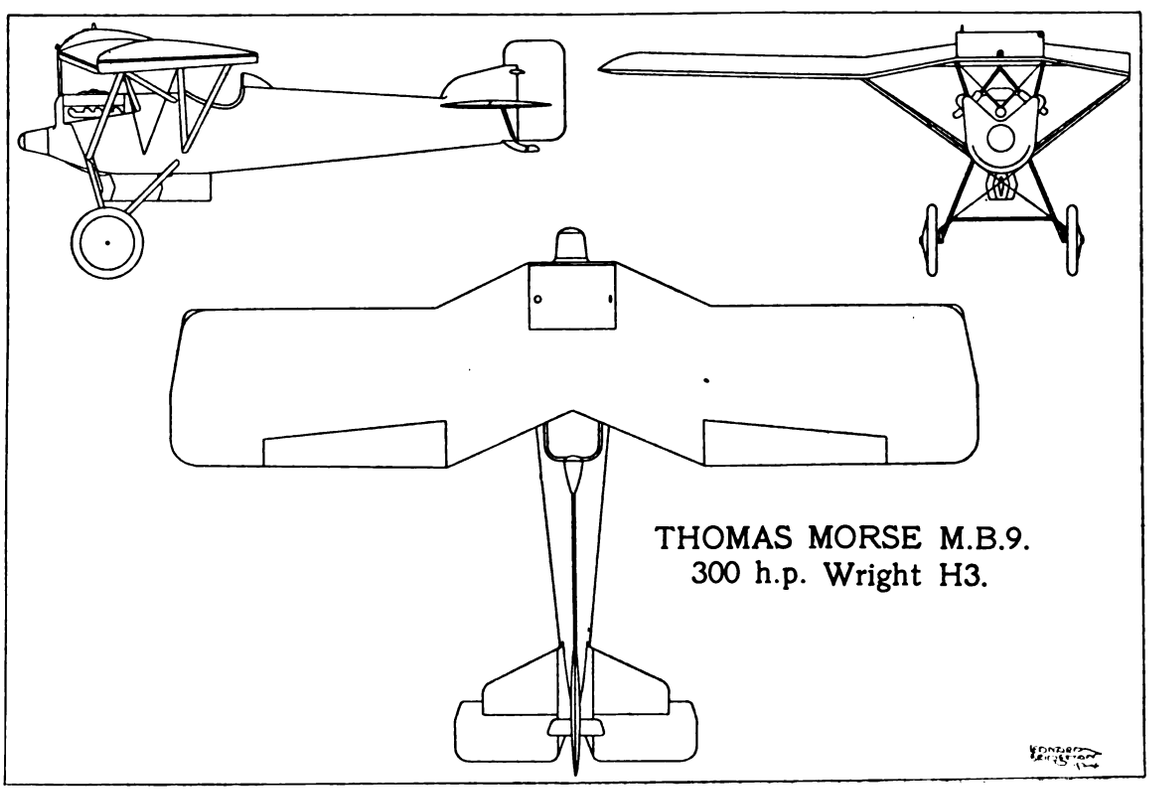
THOMAS MORSE—*continued.*



The Thomas-Morse S.9 (200 h.p. Wright engine).

Specification of the Type S-9 Side-by-side Training aeroplane.

Span	**29 ft. (8.74 m.).**
Length	**20 ft. 10 in. (6.35 m.).**
Height	**8 ft. 8½ in. (2.65 m.).**
Wing area	**296 sq. ft. (27.5 sq. m.).**
Total weight (loaded)	**1,909 lbs. (867 kgs.).**
Wing loading	**6.45 lbs./sq. ft. (31.5 kgs./sq. m.).**
Weight per h.p.	**9.55 lbs. (43.3 kgs.).**
Engine	**200 h.p. Wright Model J.**
Fuel capacity	**For 2½ hours.**
Performance.	
High speed	118 m.p.h. (190 km.h.).
Landing speed	48 m.p.h. (78 km.h.).
Climb.	
At ground, to 1,120 ft. (340 m.)	1 min.
Ceiling	19,600 ft. (6,000 m.).



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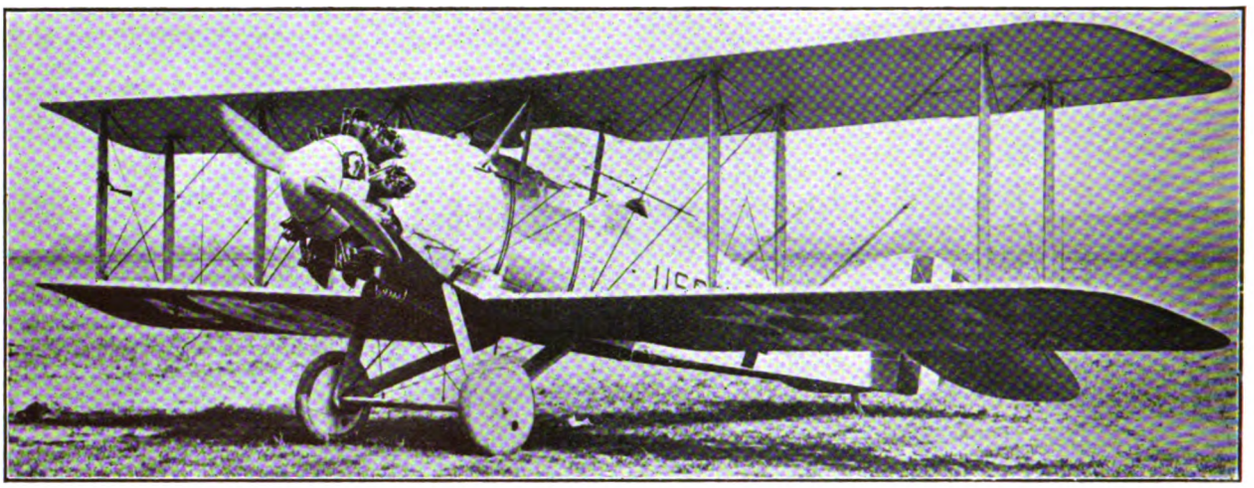
V

VOUGHT.



The Vought U.O.1 (200 h.p. Wright radial engine).

Chance Vought Corporation, Long Island City, New York.

The title of this firm has been changed from Lewis & Vought Corporation. The Head Offices and Works are at Borden and Review Avenues, Long Island City, N.Y.

The Model UO-1 Naval Observation and Gun Spotting Plane, sixty of which were constructed in 1923 by the Vought Company, has now been issued to the U.S. Naval Air Service as standard Service equipment for shipboard use. All the American Light Cruisers of the "Omaha" class will carry two Model UO-1 planes on board.

As a result of the decision of the Naval Bureau of Aeronautics to use only air-cooled engines as Service equipment up to 300 h.p. units, the 250 h.p. Aeromarine Model U-873 engine, which was originally fitted to the Vought UO-1, has been replaced by the 200 h.p. Wright Model E-4 engine. The performance of the machine has not suffered from this decrease in horsepower, as this has been amply made up by a saving in weight due both to the lesser weight of the Wright engine and the lighter engine mounting required. The specification appended gives the characteristics of the revised version.

Specification of the Vought UO-1.

Span	**34 ft. 1 in. (10.3 m.).**
Length	**24 ft. 2 in. (7.4 m.).**
Weight empty	**1,419 lbs. (644 kgs.).**
Weight loaded	**2,330 lbs. (1,060 kgs.).**
Engine	**220 h.p. Wright J-1.**
Performance.	
High speed	122 m.p.h. (197 km.h.).
Low speed	53 m.p.h. (65 km.h.).
To 8,800 ft. (2,680 m.)	10 mins.
Ceiling	18,200 ft. (5,550 m.).

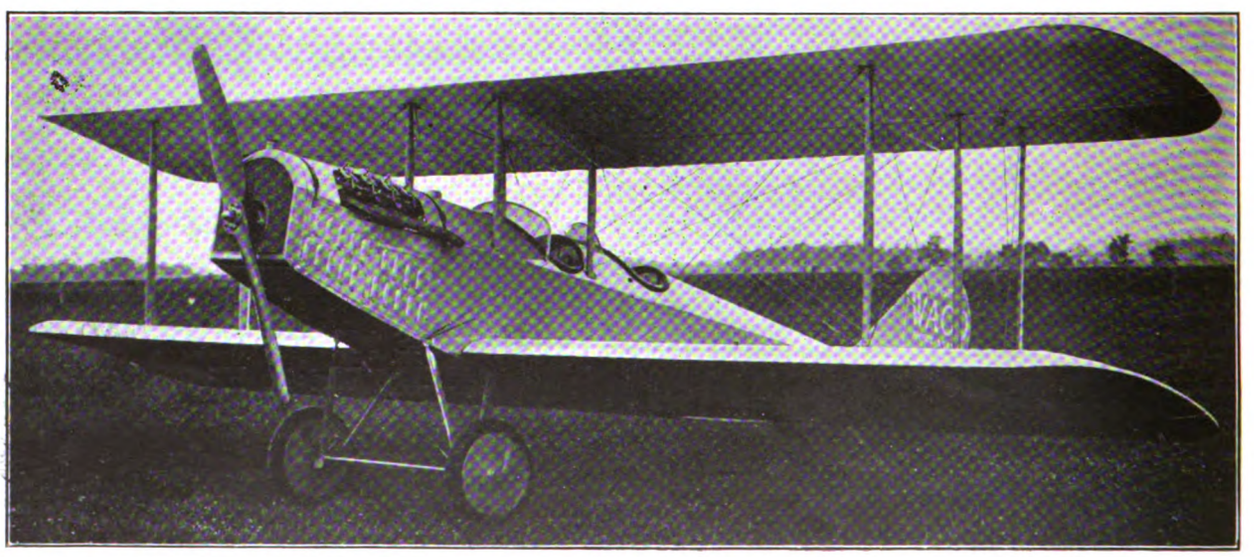
W

WACO.

Advance Aircraft Company. Offices and Works: Troy, Ohio.

This new firm produced in 1923 a commercial three-seater with the 90 h.p. Curtiss OX-5 engine and a high-lift wing curve, the Aeromarine No. 2. Constructionally, the machine, known as the Waco "Six"—the sixth model of the series—follows orthodox lines, but special pains have been taken to make it a comfortable and revenue-earning passenger carrier. Its ability to land in and take off from very small fields, together with a good performance, make the Waco "Six" a desirable machine for small joy-riding and exhibition firms.

The fuselage and wings are built up on wooden frames, fabric covered. The tail surfaces have steel frames. Streamlined steel tubes are used for the undercarraige struts.



The Waco 6 (90 h.p. Curtiss OX-5 engine).

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WACO—*continued.*

Specification of the Waco "Six."

Seats	**3.**
Span	**30 ft. (9.14 m.).**
Length	**24 ft. (7.02 m.).**
Height	**8 ft. 10 in. (2.68 m.).**
Engine	**90 h.p. Curtiss OX-5.**
Weight empty	**1,125 lbs. (512 kgs.).**
Weight loaded	**1,875 lbs. (852 kgs.).**
Performance.	
High speed	88 m.p.h. (142 km.h.).
Low speed	32 m.p.h. (52 km.h.).
Climb.	
To 465 ft. (140 m.)	1 min.
Ceiling, with pilot only	19,000 ft. (5,800 m.).

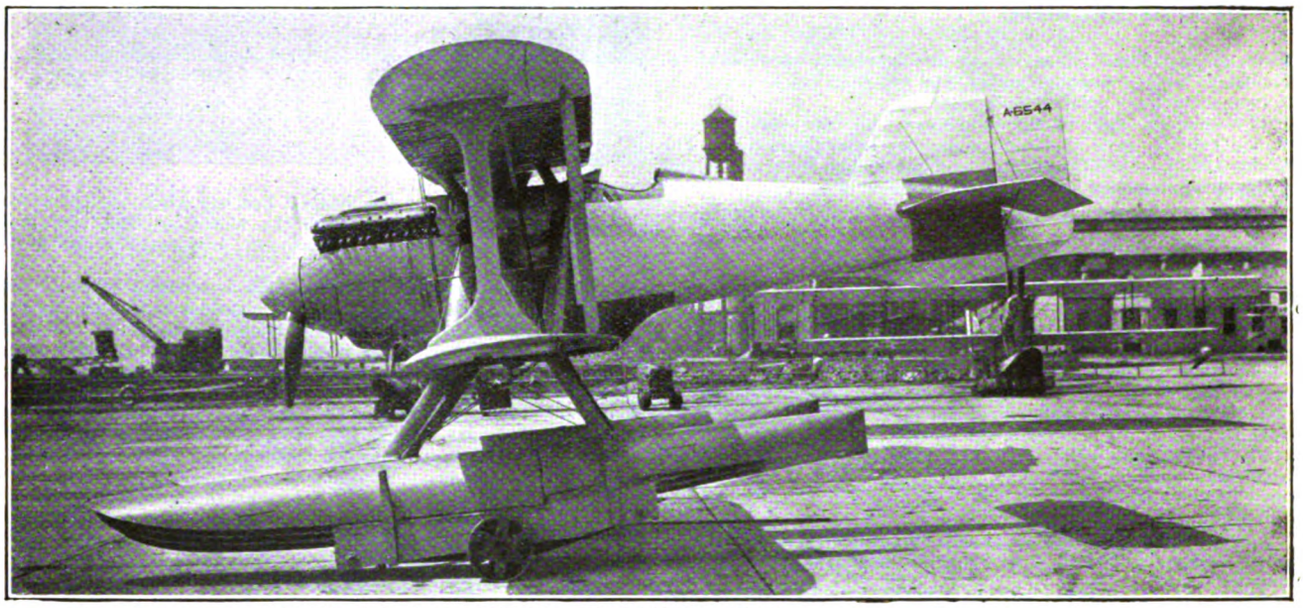
A Civil Transport Aeroplane, with seating capacity for six passengers in a cabin, and a seventh alongside the pilot, in an open cockpit, is under construction. This machine is a tractor biplane of 40 ft. (12.2 m.) span, 530 sq. ft. (49 sq. m.) wing area, and 1,750 lbs. (800 kgs.) weight empty. The engine is a 200 h.p. Hall-Scott Model L-6.

WITTEMAN.

Wittemann Aircraft Corporation, Hasbrouk Heights, New Jersey.

The Witteman Aircraft Corporation completed, in 1923, the reconstruction of twenty-five DH-4 Army Observation Aeroplanes into Type DH-4B. Since the construction of the Barling Bomber (see Barling), no new aeroplane has been produced. In the spring of 1924, the works were inactive and it was rumoured that Mr. Anthony Fokker, who had an option on this plant, had purchased it to initiate the construction of Fokker Aeroplanes in the United States.

WRIGHT.



The Wright NW-2 Schneider Cup Racer (650 h.p. Wright T.III engine).

Wright Aeronautical Corporation, Patterson, New Jersey.

The Wright Company produced, in 1923, a Racing Seaplane, which the U.S. Navy entered in the Schneider Cup race at the Isle of Wight, and two Racing Aeroplanes of the same type for the U.S. Navy team in the Pulitzer Trophy race. All three machines were fitted with the 650 h.p. Wright Model T-3 engine, of which this was the first appearance in public. The Schneider Cup Racer of the Wright Company, generally considered the dark horse of the event on account of its huge engine power and the fact—then only known by a few—that it had made 186 m.p.h. in speed trials at Anacostia, D.C., was unfortunately eliminated before the navigability trials, owing to an accident.

The two Pulitzer Trophy Racers, piloted by Lieut. L. H. H. Sanderson, U.S. Marine Corps, and Lieut. S. W. Callaway, U.S.N., finished in third and fourth places, flying the 200 kilometers at average speeds varying only six one-hundredth of miles—230.06 and 230.00 m.p.h. As this was the first opportunity the Wright Company has had to show its colors in a high-speed race, where it was pitted against the long racing experience of the Curtiss Company, the performance of the Navy Wright Racers was very remarkable indeed. These machines, as well as the Schneider Cup Racer, were built to the designs of Messrs. Booth and Thurston, who were associated, in 1922, in the Aerial Engineering Corporation of Hammondsport, N.Y., which produced the Booth or "Bee-Line" Racer for the Pulitzer Trophy race at Detroit. It is well to note that the Navy "Mystery" which the U.S. Navy entered in the 1922 Pulitzer race was not built to Wright designs, but to official designs of the U.S. Navy Department.

THE WRIGHT MODEL NW-2 SCHNEIDER CUP RACER.

This machine, a twin-float tractor biplane fitted with the 650 h.p. Wright T-3 engine, was at the time of the 1923 Schneider Cup race the highest-powered single-engine seaplane in the world.

The fuselage is built throughout of welded steel tubing. The forepart, from the engine compartment to the pilot's cockpit, the fuselage is covered with sheet aluminium, while the rear section is fabric covered over a light-weight structure of wooden stringers, which gives the body an excellent streamline. The 650 h.p. Wright engine, which has a remarkably small frontal area for its power, nicely fits into a streamlined cowling which is faired off at the nose by an aluminium spinner built over the airscrew. The oil tank, which is located under the engine, is covered by a water cooler so arranged that when the oil is cold, the oil temperature regulator transmits heat from the cooling water through a tube to the oil tank. When the oil has reached the proper temperature, the flow of heat reverses and the oil temperature regulator acts as an oil cooler. The oil cooler is of semi-circular shape, fitting well into the streamlined nose.

The tail surfaces are constructed of steel frames with fabric covering. The tail plane is braced to the fuselage and to the vertical fin by means of four tie-rods.

The wings are of biplane form, with elliptical tips and ailerons on both top and bottom wings. Streamlined rods interconnect the ailerons. The wing construction is cellular, with plywood covering and wing radiators on both wings. Very deep corrugations are used on the radiator, to give a maximum amount of cooling surface, without detracting in any way from the characteristics of the aerofoil. The top wing is braced to the fuselage by a cabane of "N" struts, and the bottom wing is braced by another set "N" struts against the top longerons at the points where the cabane struts abut. The lower "N" struts are attached to the bottom wing spars opposite to where the outer floats' bracing struts are fixed, while the inner float struts abut against the Vee-shaped excrescence of the fuselage. It will be realized that the resulting structure is exceptionally strong. The interplane bracing consists of two "I" type struts of laminated wood.

The machine is equipped with two long floats with a Vee bottom and a semi-circular top, of the type developed by the

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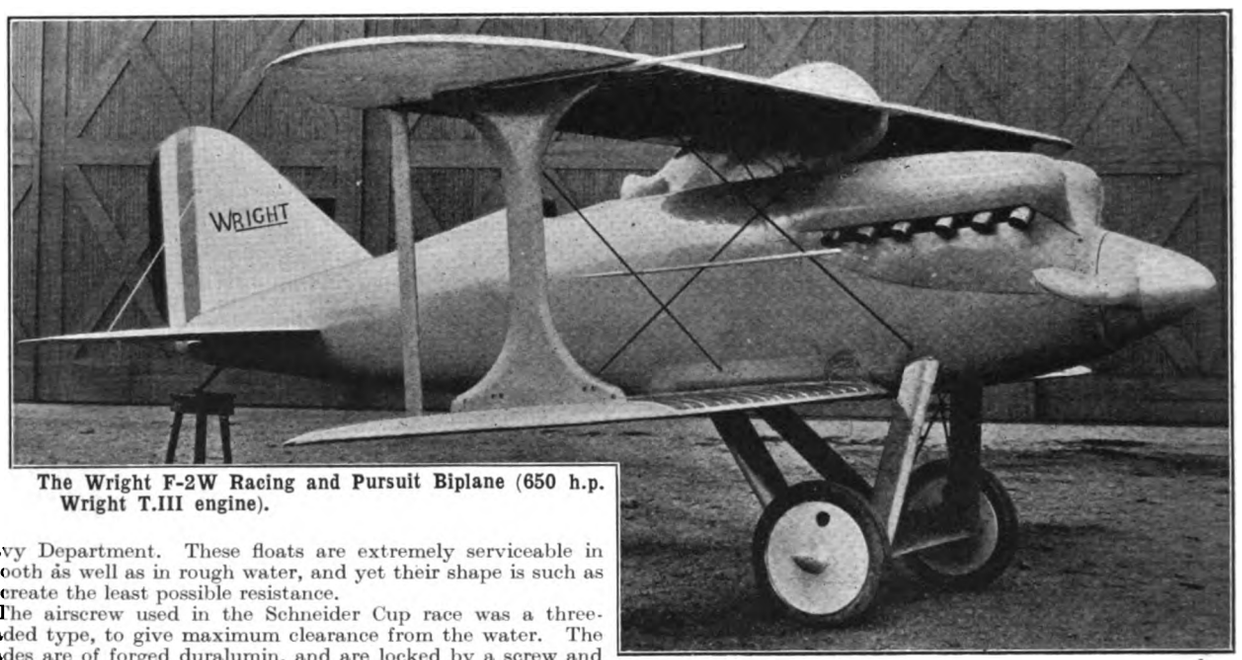
WRIGHT—*continued.*



The Wright F-2W Racing and Pursuit Biplane (650 h.p. Wright T.III engine).

Navy Department. These floats are extremely serviceable in smooth as well as in rough water, and yet their shape is such as to create the least possible resistance.

The airscrew used in the Schneider Cup race was a three-bladed type, to give maximum clearance from the water. The blades are of forged duralumin, and are locked by a screw and wedge adjustment to a forged steel airscrew hub.

WRIGHT MODEL F-2W PULITZER TROPHY RACER.

The Wright Model F-2W Racer, produced for the U.S. Navy Department in connection with the 1923 Pulitzer Trophy race, is a tractor biplane fitted with the 650 h.p. Wright Model T-3, high compression engine.

The fuselage is of the monocoque type, with two-ply spruce shell and four spruce longerons, together with plywood bulkheads. The engine mounting is of the same construction below the engine bearers as the fuselage; above the bearers there is a single diagonal steel tube strut on each side, running down from the top of the fire-proof bulkhead.

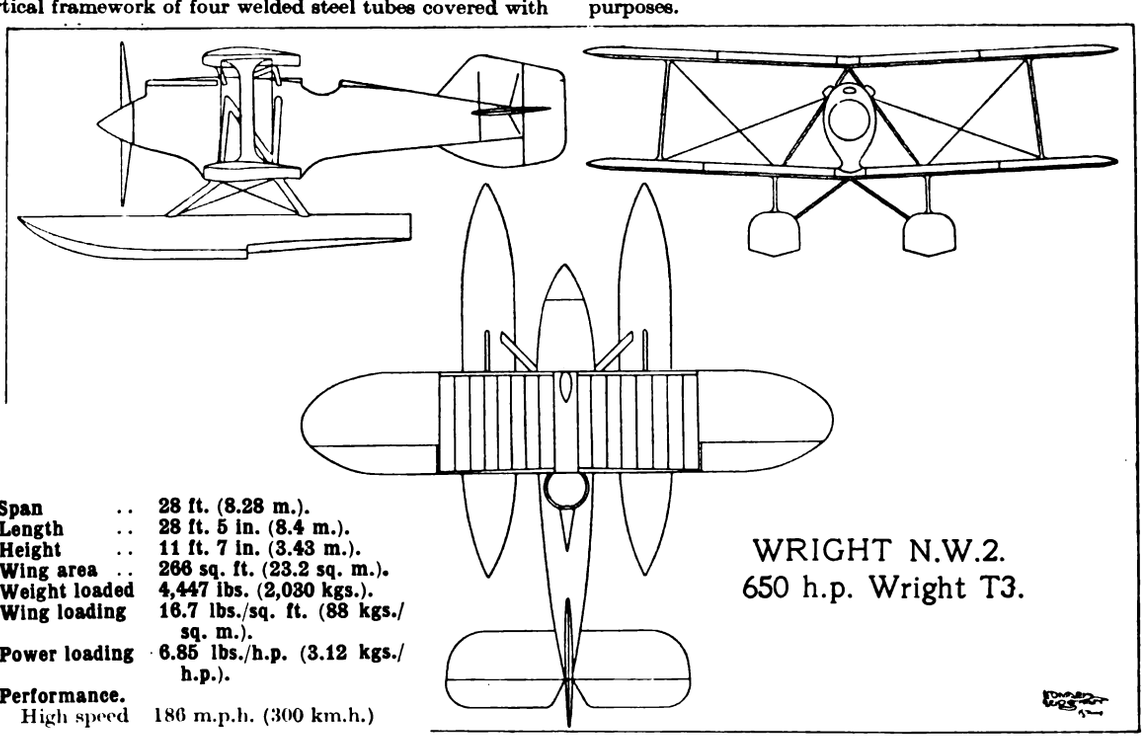
The tail plane and the vertical fin are built up of spruce webs, with mahogany ply covering. The elevator and the rudder have steel frames with fabric covering. The tail plane is adjustable for incidence on the ground.

The undercarriage consists of two steel tube Vees, faired with wood, two spreader tubes, two hinged axles and rubber-sprung wheels.

The wings are built up of spruce spars covered with two-ply spruce planking. The top wing is in one piece, while the bottom wing consists of two panels. The interplane struts are of "I" form and built up of laminated spruce, and the cabane is a rigid vertical framework of four welded steel tubes covered with fairing. The ends of the swaged bracing wires are carried by ingenious steel fittings through the wings, so that their ends are readily accessible for adjustment, but entirely out of the air-flow.

The greater part of the wing area is covered by four wing radiators. The water first enters the header of the leading edge of the wing and thence flows into cooling elements on the upper and lower surfaces of the wing. Each element is built of two sheets of thin brass sweated together, the lower sheet being slightly corrugated, and the upper one very heavily. On account of this construction, the water flows through the radiator elements in very thin streams and gives a high cooling ratio. Another header in the trailing edge of the wing collects the cold water from the cooling elements, and from here it flows into the reserve tank, which is located in the centre of the top wing. The construction of this wing radiator is such that it is a comparatively simple operation to remove any of its cooling elements for replacement without interfering with the wing or with the rest of the radiator.

The entire machine presents an unusually clean and trim appearance. Although the two machines of the Model F-2W were primarily designed for racing, the general characteristics are such that the aeroplane can easily be adapted to fighting purposes.



WRIGHT N.W.2.
650 h.p. Wright T3.

Span ..	**28 ft. (8.28 m.).**
Length ..	**28 ft. 5 in. (8.4 m.).**
Height ..	**11 ft. 7 in. (3.43 m.).**
Wing area ..	**266 sq. ft. (23.2 sq. m.).**
Weight loaded	**4,447 lbs. (2,030 kgs.).**
Wing loading	**16.7 lbs./sq. ft. (88 kgs./sq. m.).**
Power loading	**6.85 lbs./h.p. (3.12 kgs./h.p.).**
Performance.	
High speed	186 m.p.h. (300 km.h.)

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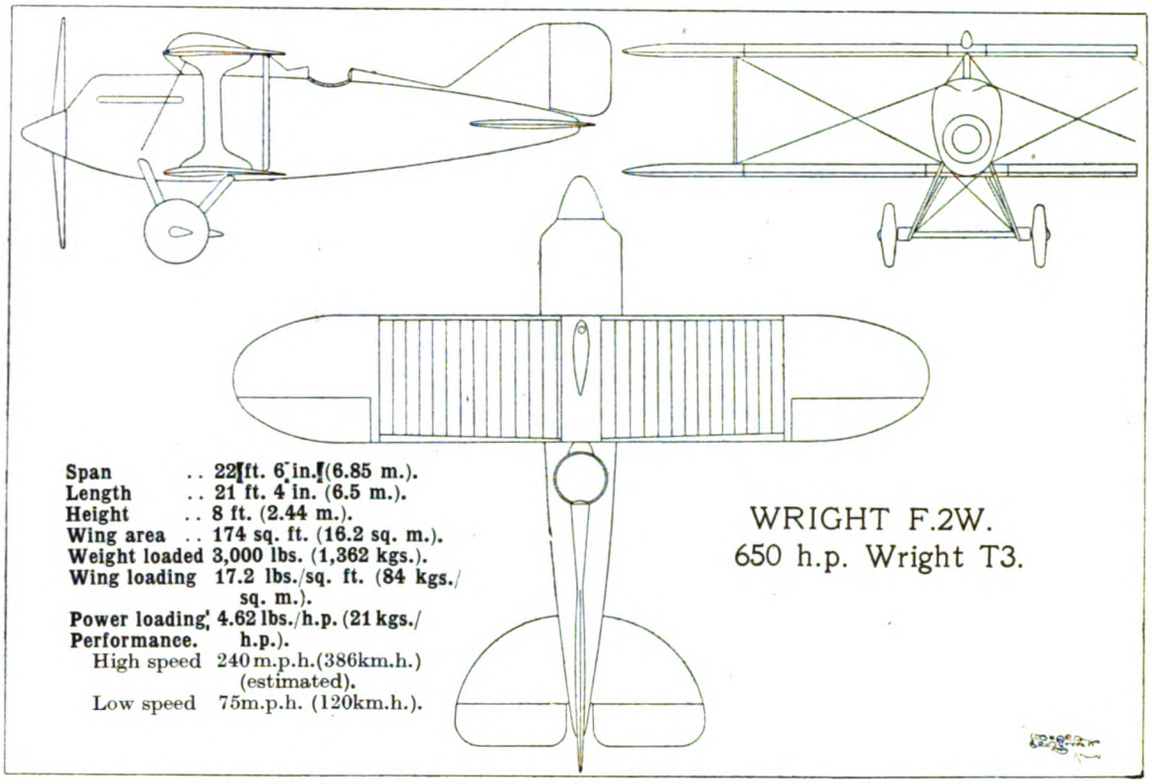
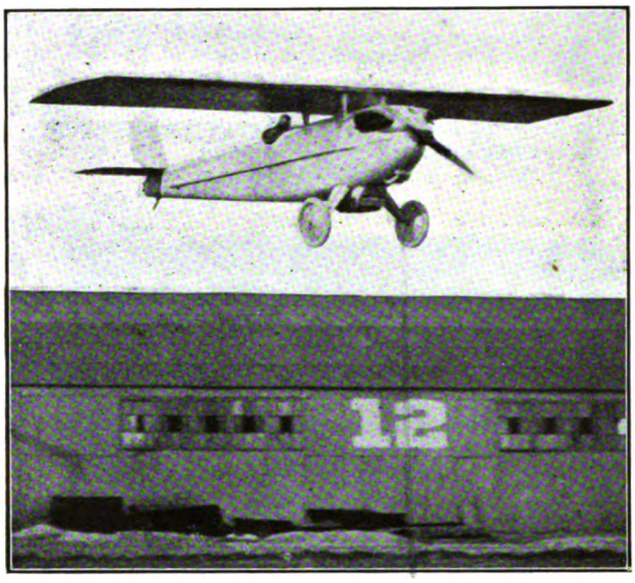
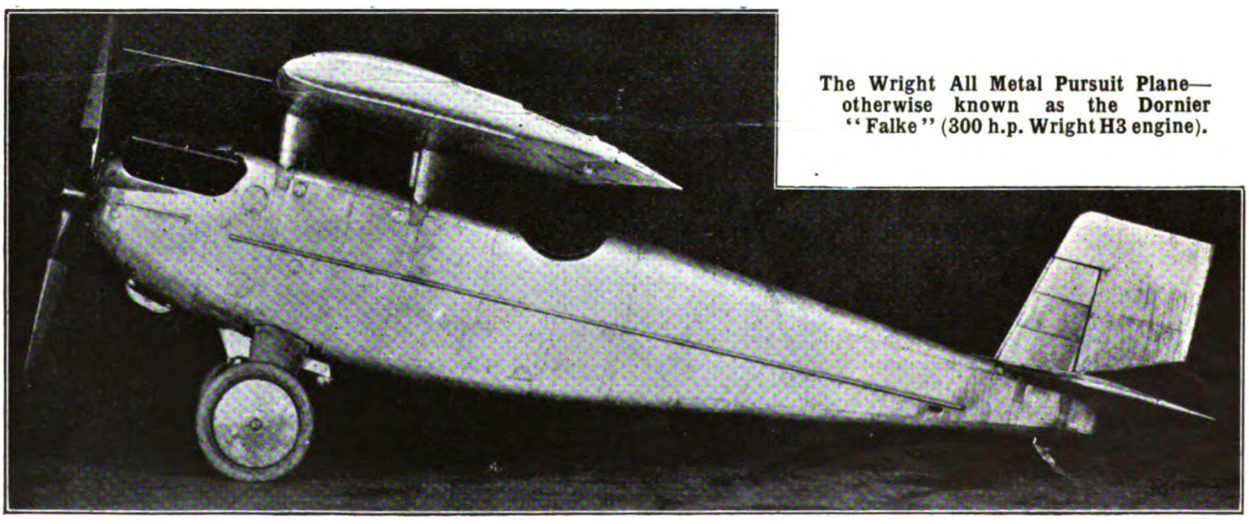
WRIGHT—*continued.*



Span	.. 22 ft. 6 in. (6.85 m.).
Length	.. 21 ft. 4 in. (6.5 m.).
Height	.. 8 ft. (2.44 m.).
Wing area	.. 174 sq. ft. (16.2 sq. m.).
Weight loaded	3,000 lbs. (1,362 kgs.).
Wing loading	17.2 lbs./sq. ft. (84 kgs./sq. m.).
Power loading	4.62 lbs./h.p. (21 kgs./h.p.).
Performance.	
High speed	240 m.p.h. (386km.h.) (estimated).
Low speed	75m.p.h. (120km.h.).

WRIGHT F.2W.
650 h.p. Wright T3.





The Wright All Metal Pursuit Plane—otherwise known as the Dornier "Falke" (300 h.p. Wright H3 engine).

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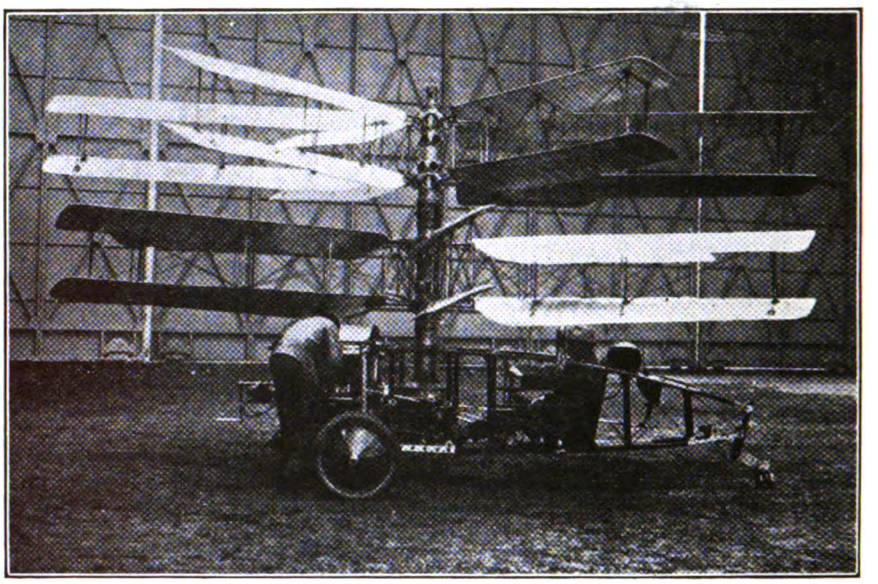
HELICOPTERS.



The Pescara helicopter.

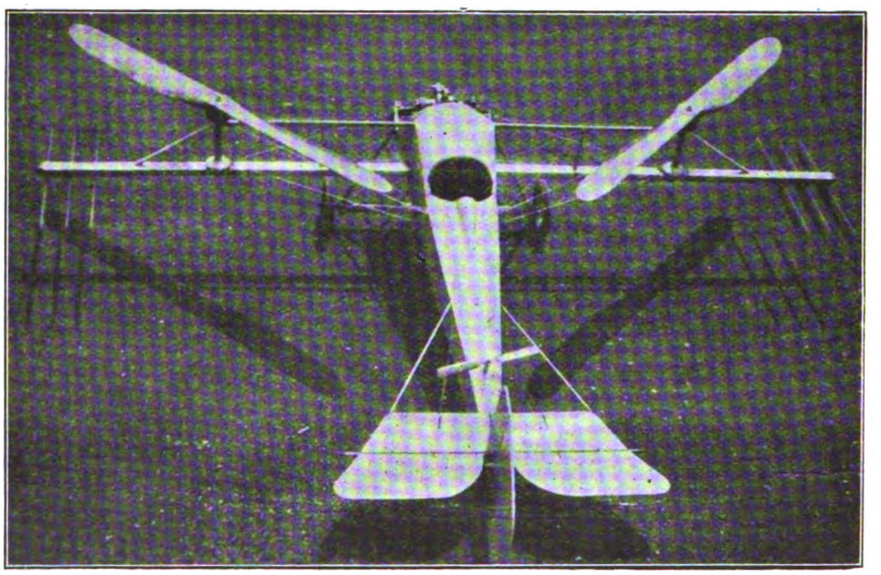
There is little to record in the matter of helicopters during 1923. In Britain the Brennan helicopter remains a dark secret at Farnborough, though it is incessantly rumoured that it is to appear in the open in the near future.

In America the de Bothezat helicopter has been abandoned by the U.S. Army authorities, after a few trials which demonstrated its ability to lift itself.

Mr. Berliner, in that country, has constructed a new machine on the lines of that described last year, but fitted with triplane instead of monoplane wings. This machine appears to be a glider with a helicopter lifting attachment.

In France, Messrs. Pescara and Oehmichen have advanced to the stage of flying circuits of round about 1,000 m. circumference at a height of 4 to 5 ft. above the ground, and are engaged in an exciting "record" breaking competition.

There is, however, as yet no sign that the problem of producing a direct lift machine with a useful performance has approached a solution.



The Berliner Helicopter of 1921. A more recent version is fitted with normal triplane wings, the main lifting screws running in the gap between top and centre plane.

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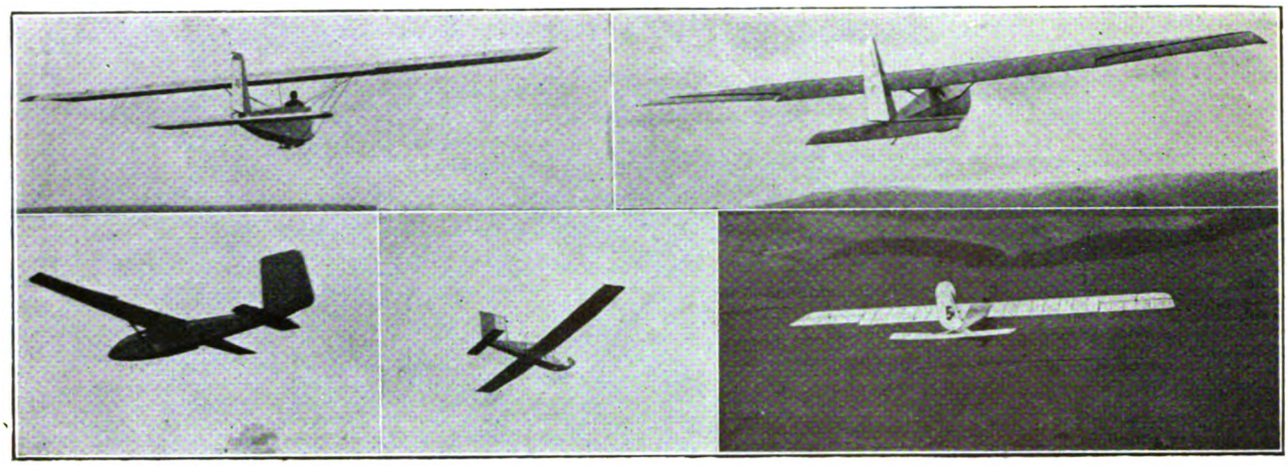
GLIDERS.

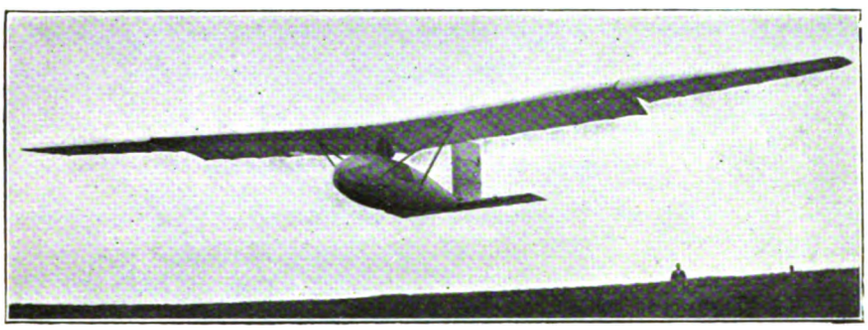


1923 GLIDERS AT THE RHÖN. Top left, the M. U. Schoop Glider built by the Dresdner Segelflugzeugbau. Top right, the Dessau Monoplane, which broke in the air in very bad weather. Bottom left, the Hubner and Schenk Monoplane with a curious tandem rudder. Bottom centre, the Darmstadt "Geheimrath," of 1922, fitted with a greatly enlarged fin and rudder. Bottom right, the "Erfurt" Monoplane which also broke in the air.

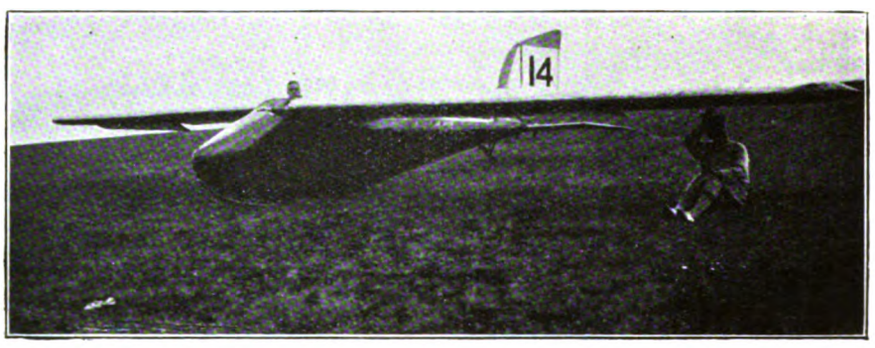
GLIDERS IN 1923.

For various reasons, the glider was not greatly in evidence during 1923. In France and England, the light aeroplane detracted attention from the engineless type. In Germany even the light aeroplane is attracting adherents at the expense of the glider, though not to so great an extent. In that country a number of new gliders were produced for the annual Rhön competitions, which, however, were afflicted by unusually violent weather. In the attempt to secure still further aerodynamic efficiency, the more advanced German designers were mostly of excessively high aspect ratio, and consequently of large span. The structural problems of building light machines of very great span were not, however, adequately resolved, and in attempts to fly these machines in bad weather quite a number of breakages occurred in the air, some with fatal results.

Nevertheless, a few interesting machines were produced, and some of these are illustrated hereafter.



The Munchen Monoplane, designed by Finsterwalder. The wings rotate as a whole to give fore and aft control—the tail plane is fixed. For lateral control, the wing tips are rotated separately.



The Bonn Monoplane. Designed by a former Aachen student and obviously influenced by the 1921 Hannover design.

A Biplane Glider with an aspect ratio of 19. The machine was designed by Dr. Ing. Bader and Dr. Ing. Eisenlohr, of Karlsruhe. It does not appear to have given good results.

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PART C.

THE

WORLD'S AERO-ENGINES.

ARRANGED IN ALPHABETICAL ORDER OF

NATIONALITY.

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BRITISH ENGINES.

ARMSTRONG SIDDELEY.

ARMSTRONG SIDDELEY MOTORS, LTD., Coventry.

A combination of the interests of the Siddeley Motor Car Co., with those of Sir W. G. Armstrong Whitworth & Co., Ltd.

During the War the Siddeley Company were entrusted with the development of the B.H.P. engines on a production basis, and developed an aluminium cylinder-block construction. The general history of this procedure was referred to under the heading "B.H.P." in the 1919 edition of "All the World's Aircraft."

Since the Armistice the Siddeley "Puma" of 230 h.p. has done excellent work.

THE 230 H.P. "PUMA."

All cylinders are of steel, screwed into aluminium heads. These heads are each common to three cylinders, which thus form a block, the "Puma" possessing two such, Overhead camshafts carried in the upper portion of these heads operate the valves, two exhausts and one inlet.

The cylinders are mounted upon a split cast aluminium crankcase, the upper half whereof carries the whole engine and is provided with massive cast feet for the support thereto, in the aeroplane. The lower crankcase half serves the purpose of an oil collector and guard, and is kept free from oil by the scavenging half of the double oil pump, the other portion whereof force-feeds all the important bearings.

The whole of the valve and auxiliary driving gear is fitted to the end of the crankcase farthest from the airscrew shaft, where the whole of the parts likely to need attention are readily accessible.

Specifications of the Armstrong-Siddeley "Puma."

No. of cylinders	6.
Bore	5.7 ins.
Stroke	7.5 ins.
B.H.P.	246.
R.P.M.	1,400.
Petrol consumption per hour	17 galls.
Oil consumption per hour	10 pts.
Weight (dry)	636 lbs.
Overall width	24 ins.
Overall height	44 ins.
Overall length	70 ins.
Bearer centres	17.2 ins.

THE SIDDELEY AIR-COOLED "LYNX" AND "JAGUAR" ENGINES.

The original design of these engines was the result of an ideal specification issued by the Engine Section of the Air Board in the far off days of 1917. That specification was issued with the belief that all its provisions were not practically attainable—but it is doubtful whether those who drew it up realised quite how many difficulties were to be encountered before an engine to comply with it could be produced. However, the practical problems have been solved, and the Siddeley "Jaguar" has passed the Air Ministry Type Trial tests with great success, and may now be reckoned among the relatively small band of proved modern aero-engines.

There are two Siddeley air-cooled engines, the "Lynx" 7-cylinder 175 h.p. and the "Jaguar" 14-cylinder 380 h.p. type. The "Jaguar" is a two-row edition of the "Lynx," and the cylinders, connecting rods, valve gear and general construction of the two engines are identical.

The general features of the two may therefore be dealt with at one time, such minor divergences as exist being pointed out in the process.

Cylinders.

The cylinders of the two engines are of compound construction—steel barrels with aluminium alloy heads. The barrels are machined from solid steel ingots, and are provided with radiating fins extending down to the crankcase circumference.

The cylinder heads are cast in aluminium alloy, and are screwed onto the top of the cylinder barrels warm, so that they shrink on tight.

The barrel is fitted with a lock nut, in the form of a screwed-on extra radiating fin. When the head is screwed into place, this lock ring is screwed tight against the head casting, and a coned facing pinches the aluminium casting into the threads on the barrel. This construction is thus somewhat similar to that used on the Siddeley "Puma" engine.

The combustion space in the head is roughly hemispherical. Valve ports and guides are cast in the head. Valve seats are of bronze expanded into the casting.

The cylinders are fixed to the crankcase by the agency of a steel ring, pinned to the crankcase, into which the cylinders screw, and are locked in position by a double-coned locking ring, which screws hard up on the first ring.

Pistons.

The pistons are of aluminium alloy, die cast on the outer surface, with sand cores for the interior. They are fitted with two cast-iron gas rings and one scraper ring above the gudgeon pins, and one scraper ring below the gudgeon pin. The gudgeon pins are hollow, and float in the gudgeon pin bosses, spring rings in the outer end of the boss bore limiting the end play available. The gudgeon pins are of very large diameter and provide a very ample bearing surface, both in the piston bosses and for the little ends of the connecting rods.

Not only does the gudgeon pin float in the piston, but it runs on a floating bush in the little end of the connecting rod.

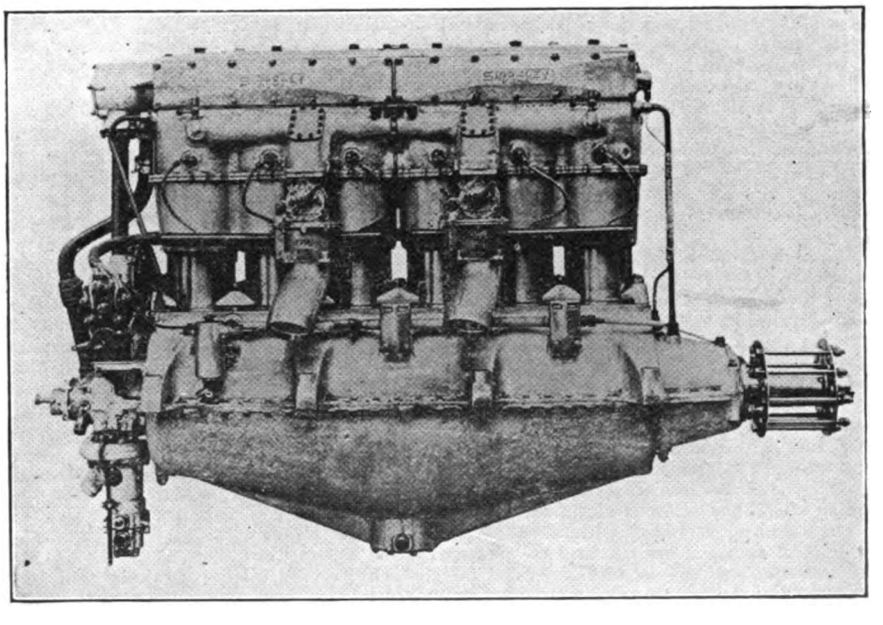
Connecting Rods and Big Ends.

The connecting rods are of steel, machined all over to definite weight, to ensure perfect balance. The big end proper is a separate part, coupled to the master connecting rod by two pins, and to the remaining six rods by one pin each.

This big end is a split steel bearing shell fitted with side webs carrying the connecting-rod pins, and extended in the line of the master rod to carry the second pin which locks big end and master rod together. The pins for the ordinary rods float in bronze bushes in the big end webs. They are locked against end movement by spring rings similar to those used for the gudgeon pins. The big end bushes in the rods also float on the rods themselves. The rods are of circular section, bored out to a large internal diameter. The master rod is of channel section.

Crankshafts.

The crankshaft of the "Lynx" is of the single-throw type. That of the "Jaguar" is of the two-throw opposed type. Both are machined in one piece and are carried on three journal roller bearings, and held longitudinally by a double acting ball thrust race at the airscrew end. Bronze counter-balance weights are fitted to the crankshafts of both engines.



The Armstrong Siddeley "Puma" Engine.—230 h.p.

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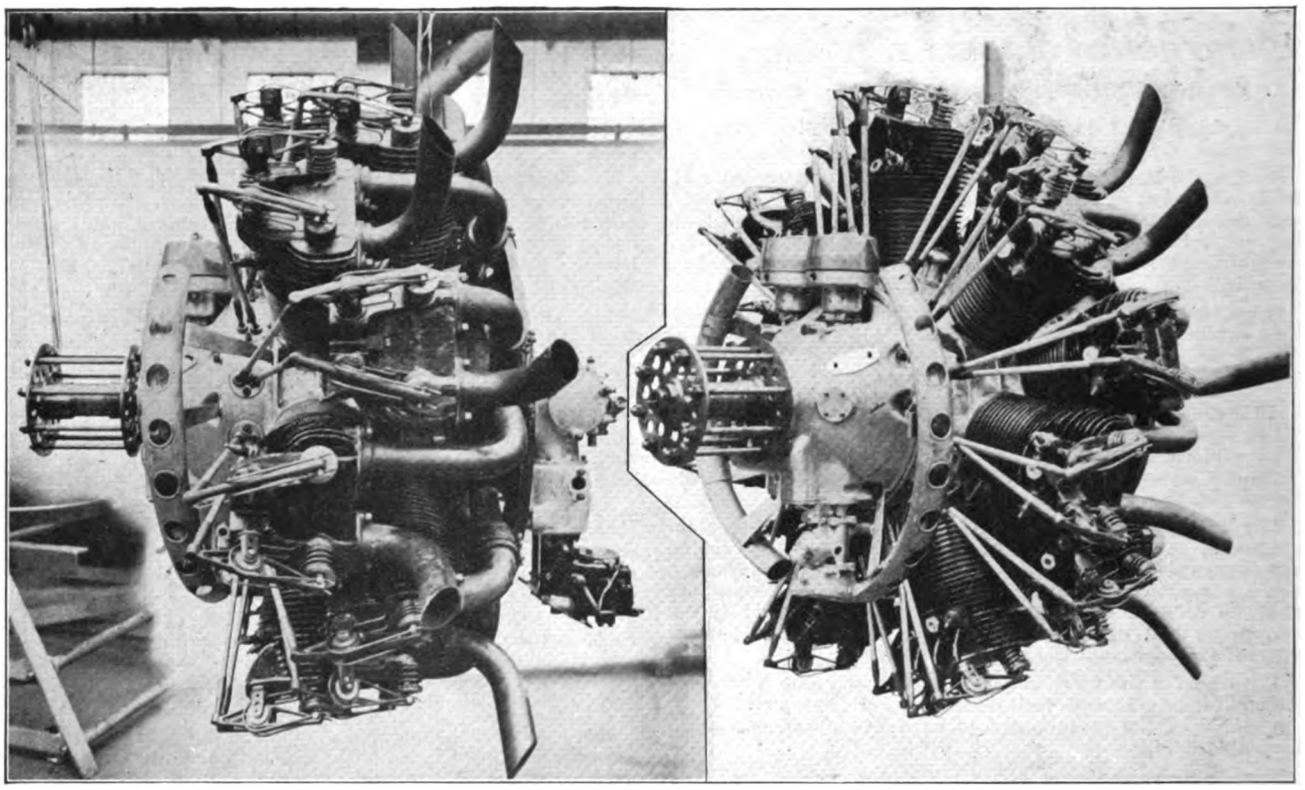
ARMSTRONG SIDDELEY—*continued.*



Two views of the 14-cylinder 325 h.p. Siddeley "Jaguar" air-cooled engine.

Crankcase.

The engine body is made in three parts. The crankcase proper carries cylinders, tappet guides and engine-carrying devices. In the case of the "Lynx," four feet carrying studs for attachment to the fuselage are cast on the crankcase. In the "Jaguar," a flange is provided to which a pressed steel cone is attached, and this latter forms the engine bearer.

The back cover carries the crankshaft rear bearing and also plays an important part in the induction system—as will be described later.

The front cover carries the crankshaft front journal and thrust bearing and the auxiliary drives for cams, ignition gear and oil pumps.

Valve Gear.

Each cylinder is fitted with two valves—one each inlet and exhaust. These valves, their springs and washers are all identical and interchangeable.

The valves are controlled by two cam rings, one for exhaust and one for inlet valves. Each ring carries three cams and rotates at one-sixth engine speed in a direction opposite to that of the engine. The cam ring drive is taken from the front end of the crankshaft, and is in the form of an epicyclic gear. The valves are operated through roller tappets, ball-ended tubular push rods and rocker arms in the usual way.

The rocker arms are of very light and stiff construction, and are carried in ball bearings at their pivots.

Lubrication.

Lubrication is on the dry base system—a scavenger pump of about 35 per cent. greater capacity than the pressure pump being fitted. Both pumps are of the gear type, and are made with duralumin gears. Oil is taken from the tank and forced through the hollow crankshaft to the crank pin—or pins in the case of the "Jaguar"—where it is discharged through a central hole. Two further holes, one at each end of the crank pins, serve for the return of the greater part of the oil. The clearance between the big end bearing and the crank webs is adjusted so that only a limited amount of oil is thrown out by the crank—just enough to provide for cylinder lubrication. The greater part of the oil returns through a separate channel in the crankshaft, and is not allowed to splash about the crankcase.

The oil filter is fitted with a gauze in a movable lantern, held in place by a spring, and so arranged that, if the filter becomes choked, the lantern is forced off the seat by the oil pressure and the engine is lubricated by unfiltered oil.

Induction System.

Mixture is supplied by a normal carburetter—a dual type in the "Jaguar" and a single type in the "Lynx." A special air intake, with a valve under the pilot's control, is fitted so that air may be taken either from the neighbourhood of the cylinder heads, or from outside the cowl, thus allowing a control of air temperature. Above the carburetter is an exhaust jacketed heater box, and the mixture passes thence to the centre of a centrifugal fan fitted in the rear cover of the crankcase. This fan, which rotates at crankshaft speed, serves thoroughly to mix the petrol and air supplied by the carburetter, and distributes the mixture uniformly to all cylinders.

The front of the fan chamber is the rear wall of the crankcase. In the rear cover there is formed an annular passage through which the hot oil from the scavenger pump passes on its way to the oil tank. The mixture in the chamber is thus warmed from both sides.

There are seven equally spaced mixture outlets round the circumference of the fan chamber, and seven induction pipes take mixture thence to the cylinders. In the "Jaguar," these pipes are forked—each pipe branching to serve one front and one rear row cylinder. In the "Lynx," the pipes are straight and each serves one cylinder only.

Auxiliaries.

The arrangement of the engine auxiliaries is somewhat different in the two engines. The "Jaguar" is fitted with a coil and accumulator ignition, the "Lynx" with magneto ignition.

In the "Jaguar" there are two vertical shafts carried in the crankcase front cover, one on each side of the crankshaft. These shafts are driven through skew gears from a sleeve on the crankshaft which carries the timing gear drive. The vertical shafts drive, at their upper ends, two 14-cylinder distributors, with the appropriate contact breaker. The lower ends drive the two oil pumps.

The "Lynx" auxiliary drives are generally similar. According to one specification, two 7-cylinder magnetos are driven from the rear of the engine, but one has a recollection of a magneto mounted in the position occupied on the "Jaguar" by the distributors. The arrangements in this respect have been modified recently, and one is a little uncertain as to the present standard in this matter.

General.

In design and in construction, these engines show very strong evidence of the thought and care which has been expended upon

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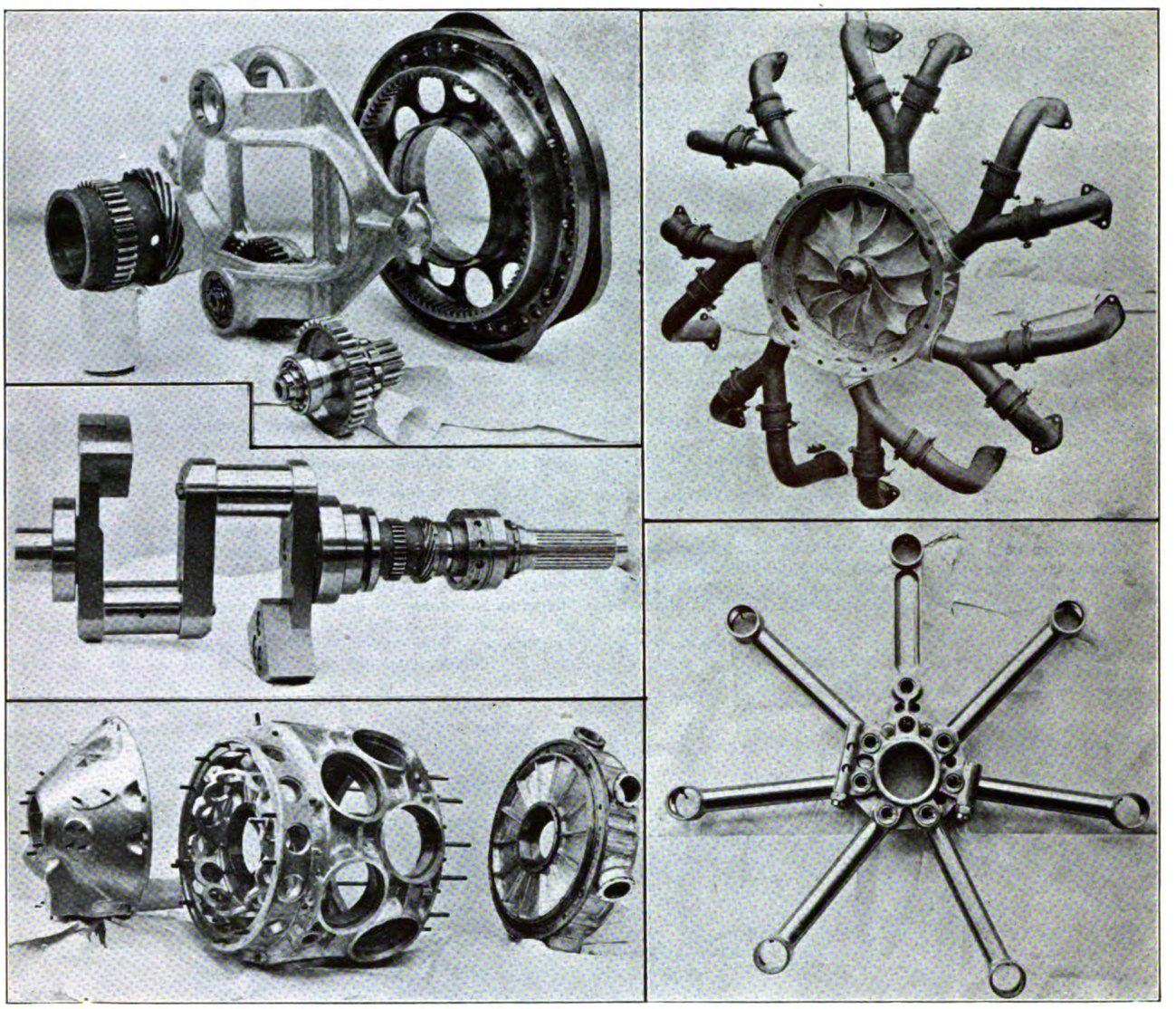
ARMSTRONG SIDDELEY—*continued.*



DETAILS OF THE SIDDELEY "JAGUAR."—On the left : Top, the cam rings, the intermediate gears and frame, and the crankshaft gear sleeve ; Centre, the crankshaft with bearings and gears in place ; Bottom, the three components of the crankcase. Right : Top, the induction system, showing the fan ; Bottom, the connecting rod and big-end assembly.

them. The construction throughout is about as simple as it is possible for so complex a mechanism to be, although one can see evidence that the designer has had in view the practical problems of construction—and in consequence the engines must be about the most straightforward manufacturing jobs in their own classes.

The workmanship put into the engine itself is of the very first class—and a stripped "Jaguar," which had just completed the type test, showed no signs whatever of having suffered in the process. It had obviously run, but the fit of the moving parts was of that silky nature which at once contradicts any suspicions of the beginning of wear.

The "Jaguar" Type Tests.

The first type test of the "Jaguar" engine, made under the supervision of the Air Ministry, was carried out between June 17th and June 21st, 1922. The engine was new, having only run the usual maker's test before making the type test. The trials were made under the new regulations, which call for 50 hours' running in 10-hour non-stop runs—instead of calling for only one such run and allowing the remaining 40 hours to be worked off in convenient instalments.

The first operation was 40 mins. run for the taking of a power curve on June 17th. This was followed by 9 hrs. 55 mins. run at 284.6 b.h.p. and 5 mins. at 330.2 b.h.p. On the 18th, 19th, 20th, and during the night 20th-21st, four more 10-hour runs—9 hrs. 55 mins. at cruising h.p. and 5 mins. at full power, were made. The average cruising powers on these runs were : 294.1, 293.6, 293.9 and 292.8 b.h.p. ; and the maximum powers were : 331.4, 330.3, 330 and 342.2 b.h.p. respectively.

On the 21st June, 40 mins. run at 737 r.p.m. was followed by a satisfactory acceleration test. On the same day, a high-speed test—1 hour at 1,751 r.p.m. and 267 b.h.p.—and an hour of test at 1,648 r.p.m. and 373.5 b.h.p., and a second power curve run were made.

The fuel consumption over the whole test was under 0.6 pints per h.p. hour, and the oil consumption was only 0.02 pints per h.p. hour. The power curve taken after the test was better than that taken at the beginning—which tends to show that the engine would have done better had it had a little more preliminary "running in," and, as has been mentioned already, the condition of the engine after the test was excellent.

More recent versions of the engine give still more power than was attained in these original tests.

Specifications of the Siddeley Air-cooled Engines.

	"Jaguar."	"Lynx."
No. of cylinders ..	14.	7.
Bore	5 ins.	5 ins.
Stroke	5½ ins.	5½ ins.
Normal rated b.h.p. ..	320.	160.
Maximum rated b.h.p.	360.	180.
Normal r.p.m. ..	1,500.	1,500.
Maximum recommended r.p.m. ..	1,650.	1,650.
Direction of rotation	L.H. Tractor.	L.H. Tractor.
Petrol consumption	.53 pts./b.h.p./hr.	.53 pts./b.h.p./hr.
Oil consumption ..	.03 pts./b.h.p./hr.	.04 pts./b.h.p./hr.
Weight	710 lbs.	—
Compression ratio ..	5 to 1.	5 to 1.
Length, overall ..	46.5 ins.	—
Length, engine-bearer plate to back of propeller	26.5 ins.	—
Diameter—over cylinder heads	43 ins.	43 ins.
Diameter—Sparking Plug pitch circle ..	33 ins.	33 ins.
Diameter — Bearer Bolt pitch circle ..	25 ins.	—

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BEARDMORE.

THE BEARDMORE AERO ENGINE, Ltd.

Chief Office: Parkhead, Glasgow, Scotland.

Registered Office: 36, Victoria Street, Westminster, London, S.W. London Agency and Show Rooms: 112, Great Portland Street, W.

THE BEARDMORE HEAVY OIL ENGINE.

The firm is now engaged in the experimental development of a heavy oil engine with solid fuel injection, of what is generally known as the Diesel type. A single-cylinder unit has given extremely promising results on test, and a 6-cylinder engine of about 600 b.h.p. is now ready for preliminary flying tests.

THE NEW BEARDMORE ENGINES.

This heavy-oil engine is of very similar design to certain new petrol engines which are now being developed by this firm. Very little information is permitted to escape concerning these types—such as is available being given by Mr. A. E. Chorlton in a lecture to the Scottish Branch of the Royal Aeronautical Society.

Mr. Chorlton said that Beardmores were the earliest makers in this country of the six-cylinder-in-line type of aero-engine, and that experience of many years had shown that in reliability and economy this simple type was the most satisfactory. They had accordingly concentrated on the development of the in-line type of engine. The old objection of increased weight had been overcome by skill and experience in design.

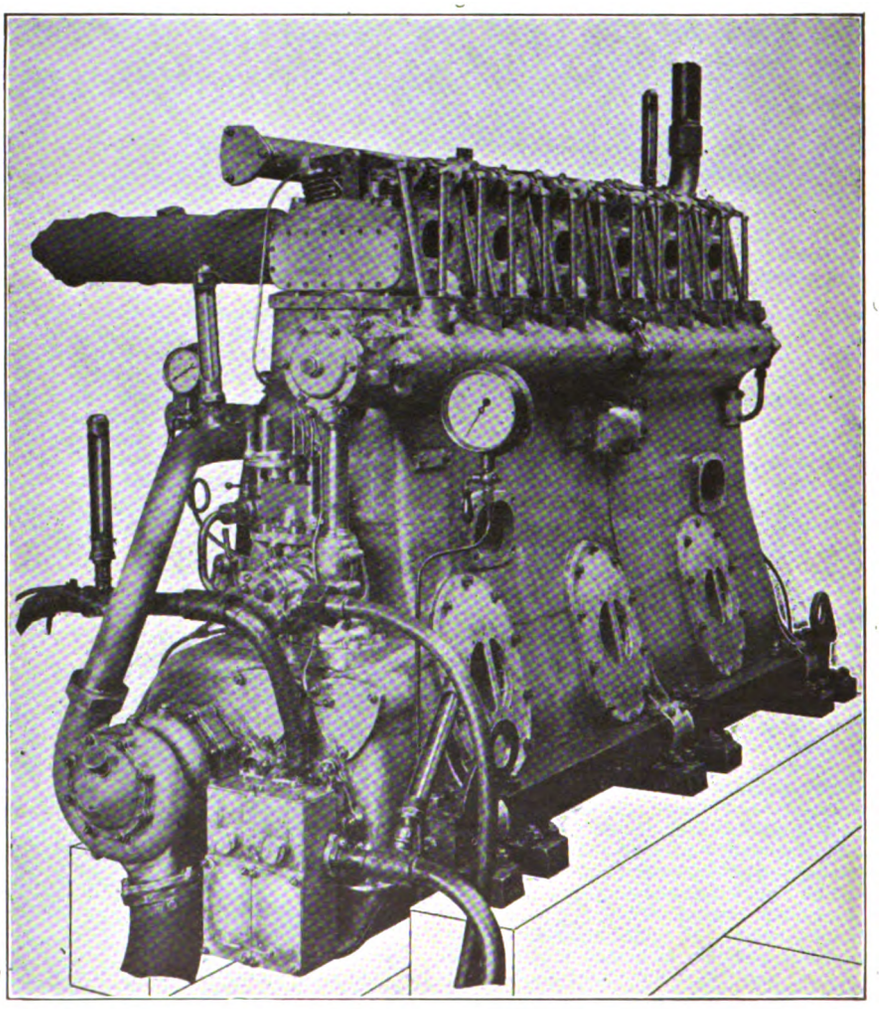
The new Beardmore engine was made either as an 8-cylinder or 6-cylinder, and of either the vertical or the inverted type. All parts throughout were interchangeable and replaceable in position. The separate cylinder covers could be removed, valves reground, and even pistons and connecting rods could be removed without dismantling the whole engine. The whole drive to cam-shaft, magnetos, pumps, etc., was a separate unit which could be replaced from stock if necessary.

The type therefore should be extremely cheap to overhaul and maintain in civilian service.

The cylinders were 8 9/16 in. bore by 12 in. stroke. The normal speed was 1,220 r.p.m., at which the 6-cylinder unit developed 800 h.p. and the 8-cylinder 1,050 h.p. The weight of the two engines was 1,825 and 2,350 lbs. respectively—very closely 2¼ lbs. per h.p.

A specially simple type of starting engine was fitted, in which one piston and connecting rod served both for the power stroke and for providing compressed gas.

Mr. Chorlton said that an engine of the same type, but fitted with cylinders of smaller bore, and fitted with a fuel-injection pump, had been made to run on crude oil, but it gave less power than did the petrol engine. One assumes that the smaller bore is used so that the same connecting-rods, crank-shaft and other working parts shall be enabled to stand the higher maximum pressure necessary for ignition by compression.



The Beardmore Heavy Oil Engine.

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BLACKBURNE.

BURNEY & BLACKBURNE, Ltd., Atlas Works, Bookham, Surrey.

Builders of the well-known motor-cycle engines. Their 697 c.c. overhead valve model was selected as the power plant for a number of the light aeroplanes built for the 1923 Lympne Competitions and gave extremely excellent results.

THE BLACKBURNE 697 c.c.

This engine is of the 2-cylinder 60° Vee twin type fitted with overhead valve gear and an external flywheel. The cylinders are of cast iron, pistons of aluminium alloy. The engine is remarkable for the high M.E.P. (about 120 lbs./sq. in.) developed at quite high speeds and for its really very satisfactory balance. An outline drawing and a power curve, together with the following brief specification, give the main characteristics.

Specification.

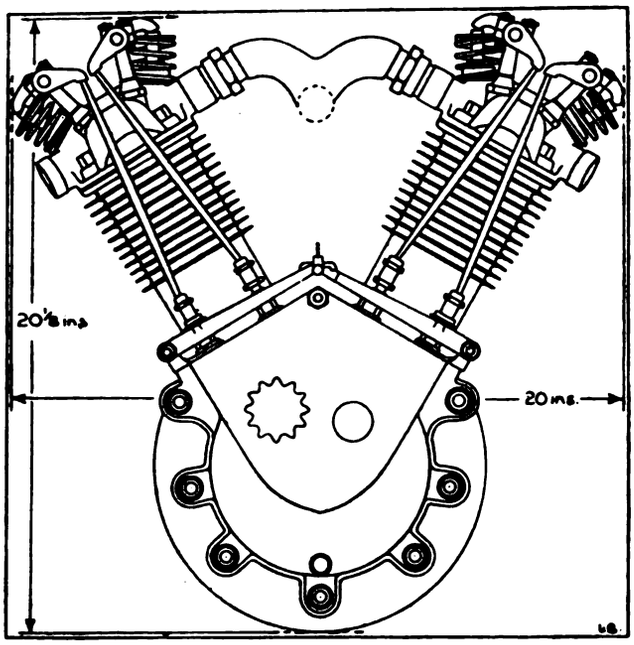
Bore	71 m/m.
Stroke	88 m/m.
Weight with magneto and flywheel	73 lbs.
Max. b.h.p.	24 at 4,500 r.p.m.

THE BLACKBURNE "TOM TIT."

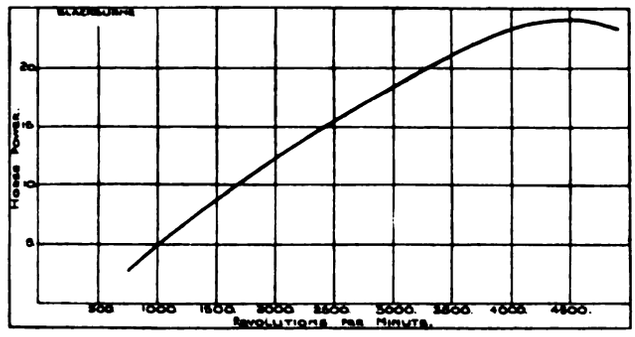
This is a modification of the original 697 c.c. engine built to fit to certain light aeroplanes for which an airworthiness certificate was required. The Air Ministry engine experts having instructed the firm as to how to produce an airworthy engine, the "Tom-Tit" has resulted.

In general arrangement the engine follows the original, but it has steel instead of cast iron cylinders. It is, however, appreciably heavier, develops less power and does not appear to be in any way superior in reliability to the original motor-cycle engine—which costs rather less than one half the price.

It is said that the firm are constructing a 3-cylinder radial of 1,100 c.c. capacity for light aeroplanes. No data are, however, available.



The Blackburne 697 c.c. Engine.



Power Curve of the Blackburne 697 c.c. Engine.

B.H.P.

Initials stand for Beardmore-Halford-Pullinger.

Made during the War by The Galloway Engine Co., Ltd., Dumfries, and the Siddeley-Deasy Motor Co., Ltd., Coventry.

Now remain only as Siddeley "Puma," for which see Armstrong-Siddeley.

B.R.

Bentley Rotary.

Designed by Mr. W. R. Bentley for the Air Department, Admiralty. Originally known as the A.R. (Admiralty Rotary) and afterwards as the B.R. (as above).

Generally very similar to the Clergét Rotaries, from which it differed in having cylinders of aluminium alloy with pressed-in steel liners.

Made in two types—B.R 1, 150 h.p., and B.R. 2, 250 h.p.

These engines are, one believes, no longer manufactured, but many B.R.2s are available from surplus Government stocks, and the engine is still in use by the R.A.F.

THE B.R. 2 ROTARY AERO ENGINE.

Specification.

No. of cylinders	9
Bore	140 m/m.
Stroke	180 m/m.
Normal b.h.p.	250
Normal r.p.m.	1250
Weight per b.h.p.	1.9 lbs.
Fuel consumption	20 galls. per hour.
Oil consumption	16 pints per hour.

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BRISTOL.

THE BRISTOL AEROPLANE CO., Ltd., Filton, Bristol.

The Bristol Aeroplane Co. took over the patent rights in the air-cooled radial engines which were formerly made by the Cosmos Engineering Co., Ltd., when that firm went into liquidation, and the development of the type is being continued.

Thus the experimental work already carried out by Mr. Roy Fedden, has not died with the Cosmos Company, and the good work done since then is a striking tribute to the enterprise of the Bristol Company.

THE "JUPITER."

The main features of these engines lie in the cylinder construction and in the ingenuity of their detailed design. The cylinders are of steel, turned from forgings, with an integral combustion head. To this the cylinder head proper, an aluminium casting with valve pockets and gas ports, is applied in suchwise that intimate mechanical contact is established over a large area and thus excellent heat passage from combustion head to the outer air is secured. Each cylinder head is fitted with two inlet and two exhaust valves, whose seats form separate units and serve an additional purpose by aiding to maintain contact between the cylinder and the aluminium head.

Pistons, naturally, are of aluminium; the connecting rods are arranged, one as a master rod and the remainder eight pivoted around the big end of the master rod.

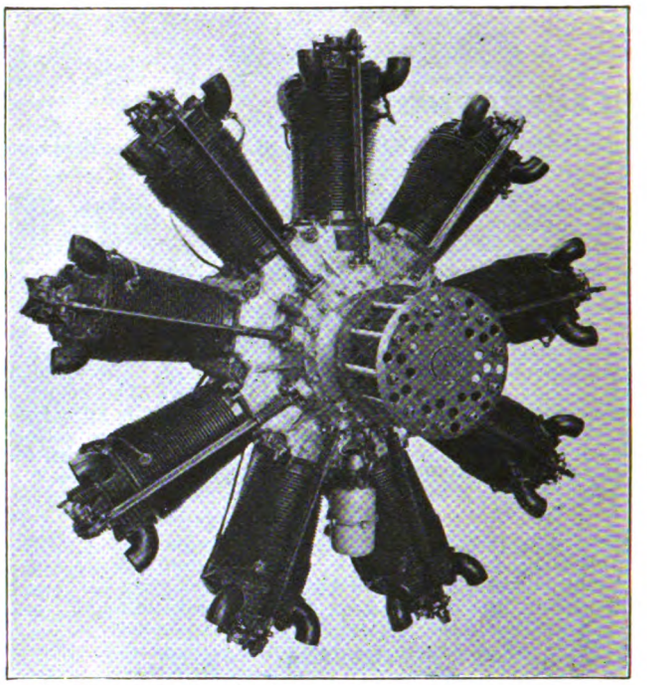
An ingenious compensating device is fitted to the valve tappets which corrects the tappet clearance for the effects of cylinder expansion with temperature.

Another extremely interesting feature is the distribution system. Gas is supplied by three carburetters to a chamber at the rear of the crankcase, and radial induction pipes lead from this drum to the inlet valves.

Within the chamber is what is called a "distributor," which is in reality an aluminium ring with three deep spiral flutes in it. The pitch of each spiral corresponds to the pitch of three cylinders, and the chamber therefore is divided into three induction passages, one of which is supplied with gas by each carburetter and in turn supplies gas to three cylinders.

It is stated that the spinning motion imparted to the inflowing gases entirely prevents condensation of petrol, and that disturbance of the mixture on any one of the groups of three cylinders interferes to a minimum extent with the running of the remaining cylinders.

The engine has since passed the type test trials of the French Air Ministry with extreme ease, and the rights in the design have been acquired by the Gnôme and Rhône firm.



The Bristol Jupiter Engine.

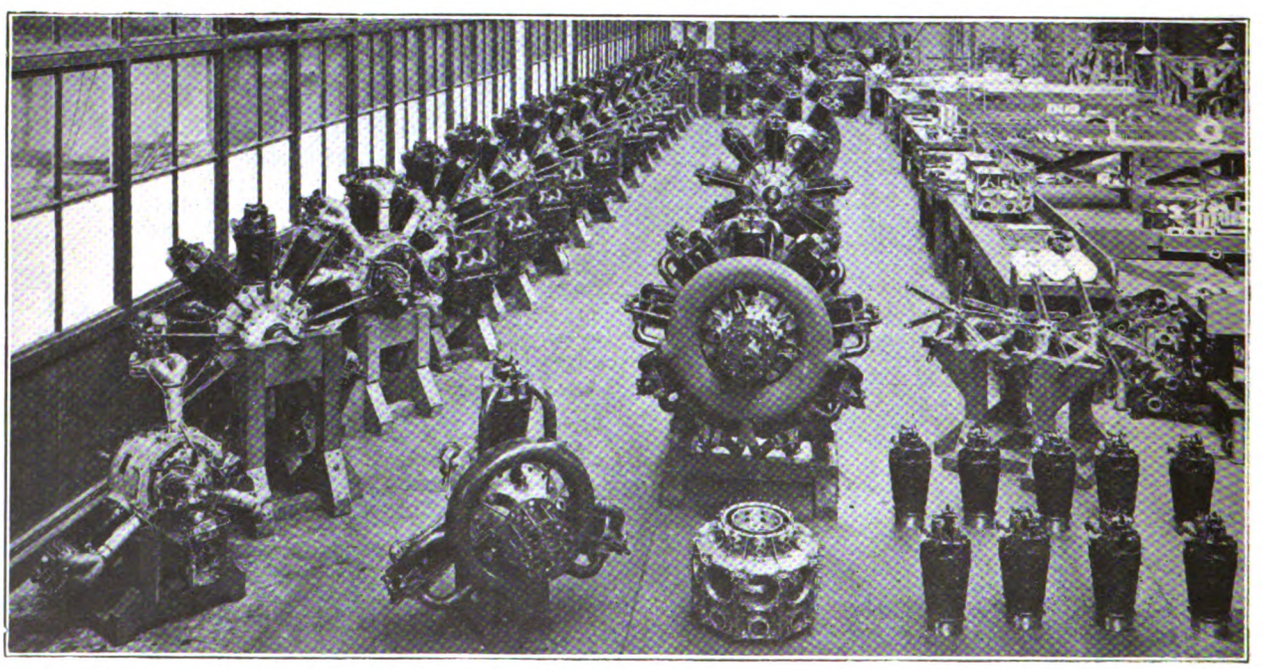
Specification of the Bristol "Jupiter."

No. of cylinders	9.
Bore	5¾ ins.
Stroke	7½ ins.
B.H.P.	400.
R.P.M.	1,550.
Weight	730 lbs.
Petrol consumption	0.594 pints per h.p. hour
Oil consumption	0.049 pints per h.p. hour.

THE JUPITER ENGINE MOUNTING.

The illustration here reproduced shows the new standardised mounting designed by the Bristol Aeroplane Co., Ltd., for the 400 h.p. Bristol "Jupiter" engine. This mounting forms a complete engine unit, with cowling, exhaust piping and external air heaters for carburetter air, ready for mounting on the end of a fuselage.

Not only is every such unit interchangeable with every similar unit, thus greatly simplifying the business of changing engines, but the aeroplane designer is spared the problems of designing cowlings, etc., giving both minimum resistance and at the same time adequate cooling, for the design has been arrived at as the result of a long series of tests, both in the air and in the wind tunnel.



A batch of Bristol Engines ready for delivery.

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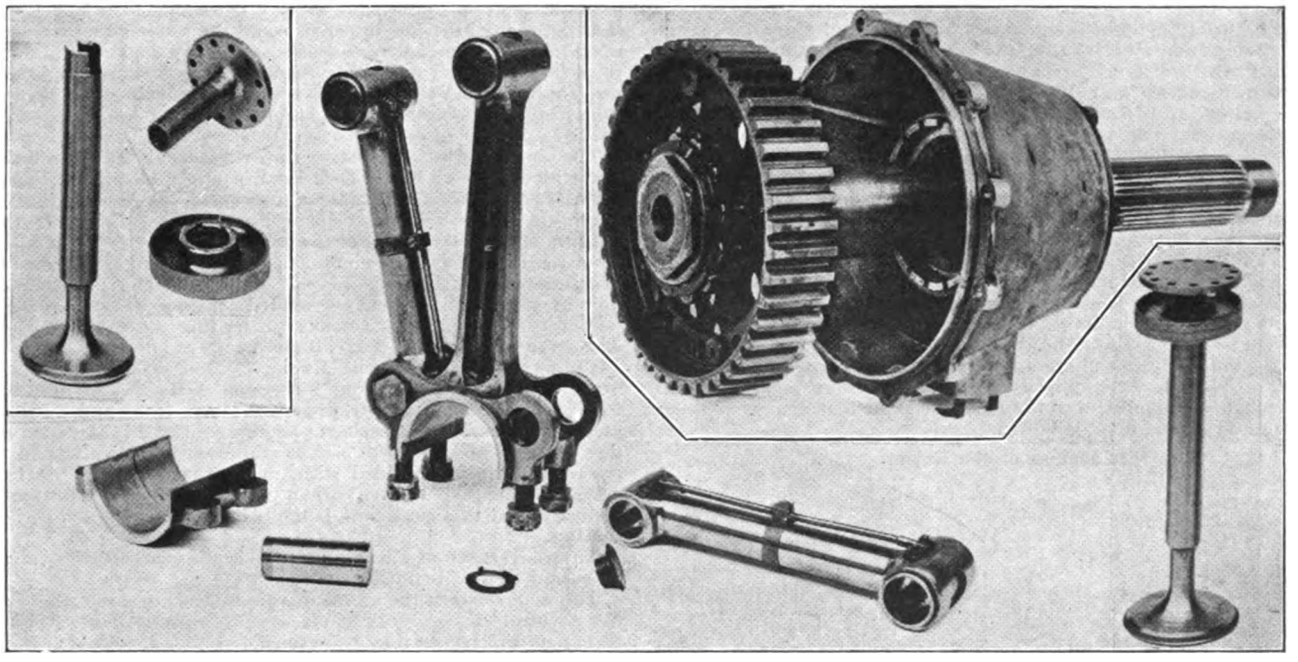
NAPIER—*continued.*



COMPONENTS OF THE NAPIER ENGINE.—Top left corner a valve with tappet head and locking ring dissembled. Bottom right corner a valve assembled. Top right corner the airscrew shaft, gear and gear housing. The remainder represents the connecting rods. The main rod, with its big end and one side rod are shown assembled. On the extreme left a big end cap, next a side rod pivot pin, with its lock plate and locking plug, and separately one complete side rod.

These auxiliary rods are of channel section, with both ends bushed with phosphor bronze. They are joined to the master rods by hollow taper-ended pins, screwed internally at the taper end. The taper end fits the hole of one of the side lugs on the big-end, and a "snug" on that end prevents turning in the lug. A hexagon-headed plug screws into the pin and locks it in place.

The crankshaft is short, massive, and is hollow through all journals and crankpins. It is carried on five roller bearings, all of the packed roller type—i.e., the rollers are practically in contact and there are no cages.

Of these five the two at the extreme ends fit directly onto the crankshaft, but the intermediate three are necessarily provided with inner races of a bore sufficient to allow of their being threaded on to the shaft over the crank-throws. Hence, they are too big to fit upon the shaft itself and a split steel packing bush is therefore inserted between bearing and shaft. This bush is keyed to prevent rotation on the shaft, and is flanged to locate the bearing longitudinally.

Beyond the airscrew-end roller-bearing a taper carries the driving pinion of the reduction gear, beyond which the overhanging shaft end is parallel and runs in a bronze and whitemetal bearing.

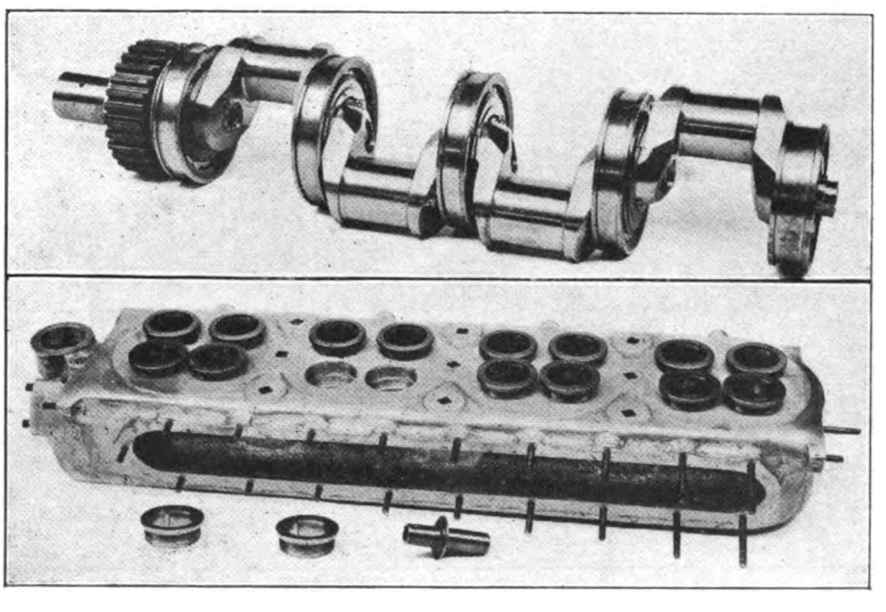
The upper crankcase is a large and somewhat complex aluminium alloy casting, with three sets of cylinder facings outwardly, and the necessary cross-ribs for the crankshaft bearings inwardly, with a housing for the airscrew shaft gear cast on to one end.

The lower bearing caps are steel straps carried by studs from the webs in the upper crankcase casting.

The airscrew shaft is supported by two roller bearings, one in the housing on the crankcase, the other on the bolted-on cover to the casing. Inwards from this roller bearing, and also carried by the casing cover, is a double-ball thrust bearing.

The whole of the valve, pump, and magneto driving gear is external to the crankcase proper.

The end of the crankshaft furthest away from the reduction gear projects beyond the end bearing and has applied to it an extension shaft, which it drives through dogs. This extension shaft carries two bevel wheels facing away from each other. The inner of these drives two camshaft drive-shafts parallel to the two outer cylinder axes, the vertical shaft for the centre row being driven from a bevel wheel on the left of the outer shafts, and a vertical down-going shaft which drives directly the water-pump and, by a worm and two worm-wheels, the oil-pumps.



NAPIER DETAILS.—Top, the crankshaft with the airscrew drive pinion and the five roller bearings in position. Below one cylinder head removed from the cylinders. The head is inverted and there may be seen in it 14 of the 16 valve seats which secure the head to the top of the cylinders. The open channel facing the observer is the induction port. Below the head may be seen two valve seats removed, and one valve stem guide.

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NAPIER—*continued.*

The outer bevel drives two horizontal shafts which actuate the two 12-cylinder magnetos. The whole of these gears, the bearings for their shafts, the oil and water pumps, and the magneto brackets form one unit, and are built into a casing formed of two aluminium castings bolted together.

Oiling is on the dry-sump principle effected by two suction pumps and one pressure pump, all of the spur-wheel type. Oil is distributed in the usual manner through the hollow crankshaft to big-end and gudgeon-pin bearings, the splash from these serving the cylinders. A separate lead from the pressure pump delivery passes to the camshafts (also hollow), and the overflow falls back to the crankcase, passing the reduction gear casing en route.

Gas is supplied to each row of cylinders by what amounts in effect to three carburetters, one for each row. There are no induction manifolds in the ordinary sense of the term; instead each cylinder-head is fitted with an induction channel in the form of an aluminium cast trough bolted to one side of the head and extending over all the induction ports, and this trough terminates at the airscrew end in a flange whereto an induction pipe may be bolted.

Specification of the Napier "Lion."

No. of cylinders	12.
Bore	5½ ins.
Stroke	5⅞ ins.
B.H.P.	460 at 2,000 r.p.m. (Compression ratio 5.8/1).
	435 at 2,000 r.p.m. (Compression ratio 5/1).
Airscrew r.p.m.	1,320 (2,000 at crankshaft).
Weight dry	900 lbs.

THE NAPIER "CUB."

That the firm of D. Napier & Son, Ltd., were constructing a new engine of greater power than their well-known "Lion" has been known for some considerable time.

This particular engine has been designed for the Royal Air Force and in general it was considered desirable that details of the actual design should be withheld.

The engine consists of four rows each of four cylinders arranged as an irregular cross round a common crankcase. The angle between the two upper rows is very considerably smaller than that between either one upper row and the nearest lower row or the angle between the two lower rows. Between the two lower rows the crankcase protrudes downwards to form a sump, and into the front end of that sump are cast the carburetter bodies, consisting of a common float-chamber and four jet chambers—one for each row of cylinders.

The angle between the two upper blocks is 52½° and the lower blocks are at 90° to their nearest upper block. Onto the upper half of the crankcase is cast half the housing for a reduction gear. This housing follows on a large scale the outlines of the gear casing of the "Lion."

At the far end from the crankcase is the casing for the valve gear, magneto and pump drives. Each cylinder is a separate unit of steel with steel sheet welded jackets. There are four valves per cylinder, each valve protruding outwards in such wise as to indicate that the cylinder heads are domed.

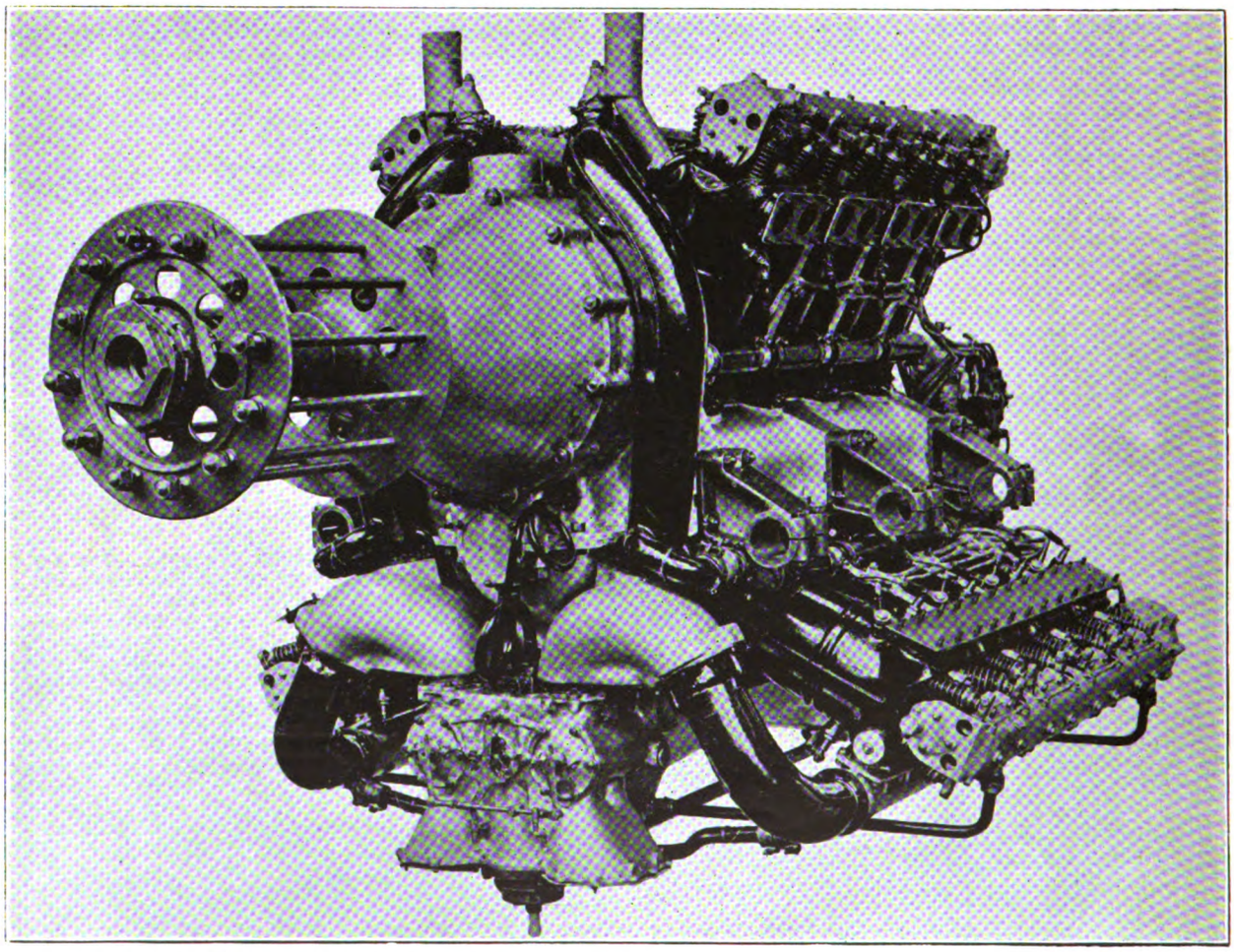
Unlike the valves of the Napier "Lion," these valves are operated by rocker-arms from a single central camshaft for each row of cylinders, each rocker-arm projects from and at right angles to, the camshaft casing; to compensate for the side-thrust due to this arrangement of valves and rockers, the valve end of the rocker-arm is provided with an internal spherical seating, which is adjustable to give correct valve clearance. The valve stem is bored to a considerable depth, finishing with a spherical seating.

The movement of the rocker-arm is conveyed to the valves by means of a ball-ended toggle pin.

The upper half of the crankcase is provided on each side with three seatings for bearer brackets, so that brackets of any suitable form and dimensions may be applied.

Although in appearance and in detail design the "Cub" obviously differs considerably from the earlier "Lion," both engines are extremely compact and clean of outline.

Nominally of 1,000 h.p., the "Cub"—like the "Lion"—has been designed for ample reserve power, which in other terms amounts to long life and high reliability at its rated output. An eloquent tribute to this quality is to be found in the fact that on its first run on the test bed—practically a running-in run and certainly not a tuned-up run—the "Cub" developed 1,057 b.h.p. At the rated output the "Cub" in its present form weighs only 2.45 lbs. per h.p.



The Napier "Cub" of 1,000 h.p. seen from airscrew end.

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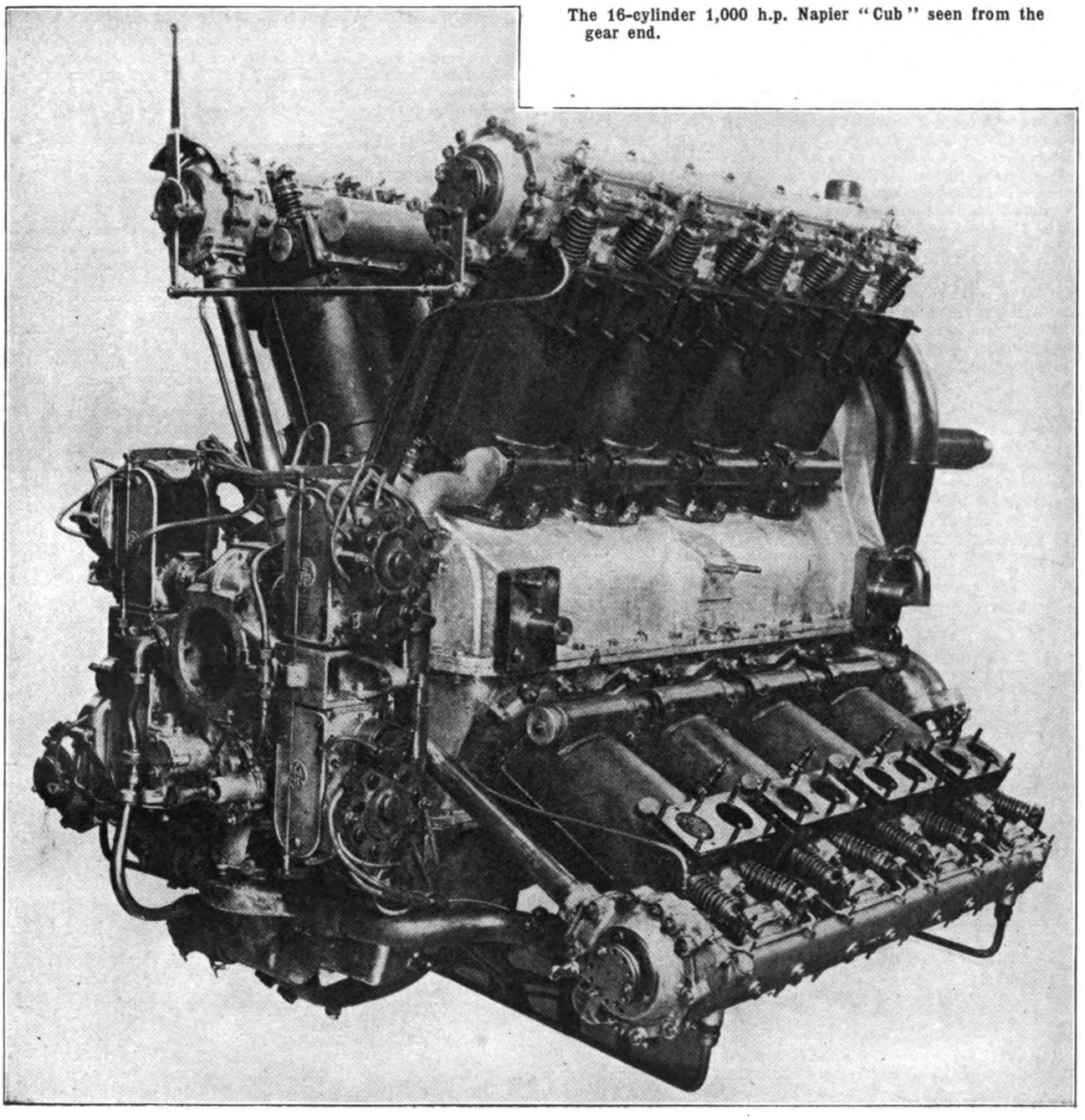
NAPIER—continued.

1,000 H.P. Napier "Cub" aero Engine.

Bore	6¼ in. (158.75 mm).
Stroke	7½ in. (190.50 mm).
Normal B.H.P. and Speed	1000 b.h.p. at 1800 r.p.m.
Total swept volume of engine	3681.6 cubic inches.
Compression ratio	5.3 to 1.
Direction of rotation of crank	Anti-clockwise viewed from airscrew end.
Do. do. of airscrews	Clockwise viewed from airscrew end.
Normal speed of propellor	752 r.p.m.
Type of gear reduction to airscrew	Spur gearing
Lubrication system	Forced to all bearings.
Type of Carburetters	Quadruple carburetter cast with oil sump.
Mixture control	Hand control.
Fuel consumption per hour	½ pint per h.p. hour.
Type of Ignition	Four magnetos.
Direction of rotation of rev. counter drive facing shaft on engine	Clockwise.
Starting arrangements	Distributer provided for gas starter.



The 16-cylinder 1,000 h.p. Napier "Cub" seen from the gear end.

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ROLLS-ROYCE.

ROLLS-ROYCE, Ltd., Derby, and Conduit Street, London, W.

The famous Rolls-Royce engines having secured an unequalled reputation in war for their reliability, have now, after sundry minor modifications, come into very general use for commercial aircraft of all types.

GENERAL DESCRIPTION OF THE ROLLS-ROYCE "FALCON" AND "EAGLE" AERO-ENGINES.

General.

These Rolls-Royce aero-engines are of the 12-cylinder water-cooled "Vee" type, fitted with an epicyclic reduction gear, magneto ignition and complete with propeller hub and engine supporting brackets suitable for tubular bearers.

Cylinders.

The cylinders are separately mounted on the crankcase in two rows of six, at an angle of 60 degs. with each other. They are of built-up all-steel construction, being machined from .6% carbon steel forgings with the heads integral with the cylinder barrels. The water-jackets are die-pressed sheet steel, acetylene welded at the joints. The valve seatings are machined in the cylinder heads.

Valves.

One inlet and one exhaust valve is provided per cylinder, operated by overhead camshafts and rockers. The valves are made from special high chromium steel forgings, working in phosphor bronze guides.

Camshaft and Rocker Mechanism.

The camshafts are enclosed in cast gun-metal cases, which are mounted on the top of the cylinders. Each camshaft is provided with five phosphor bronze bearings which are in halves, bolted together, and reamed in position.

The camshafts are machined from 5% case-hardening nickel steel bar, and ground on the bearing surfaces and cam faces. The valve rockers are 3½% nickel steel forgings machined all over and provided with hardened steel rollers bearing on the cam faces and hardened steel adjustable tappets bearing on the valve stems.

Auxiliary Gear Drives.

The gears for driving the camshafts and all auxiliaries are driven from the rear end of the crankshaft, through the medium of a spring-controlled friction damped pinion, so eliminating from all auxiliary drives, crankshaft torsional vibrations, and are totally enclosed in a suitable casing. All gears are made from 5% case-hardening nickel steel, accurately fitted to shafts running on ball bearings.

Camshaft Drive.

The camshafts are driven by means of inclined tubular driving shafts with bevel gear at the upper and lower ends. Out-of-alignment and expansion effects are allowed for by hardened serrated couplings. The driving shafts are supported in ball bearings and the whole totally enclosed in tubular casings.

Pistons

The pistons are of special aluminium alloy and of the "Zephyr" type. The advantages of this type of piston are that the crown or head is better supported and the cooling of the piston head is considerably improved.

Five piston rings are provided, arranged as four compression rings above the gudgeon pin and one scraper ring below, at the base of the skirt. The compression rings are prevented from rotation by means of stops.

The gudgeon pins are of 5% case-hardening nickel steel, hardened and ground. A special locking device is used to prevent both axial and rotational movements.

Connecting Rods.

The connecting rods are "H" section of the "articulated" type, made from 3½% nickel steel heat-treated to give a high Brinell test, machined all over to reduce weight variations. The big end of the main rod is white metal lined, the small end being fitted with a phosphor bronze bush. Both ends of the articulated rod are fitted with phosphor bronze bushes. All bearings are positively lubricated by oil under pressure.

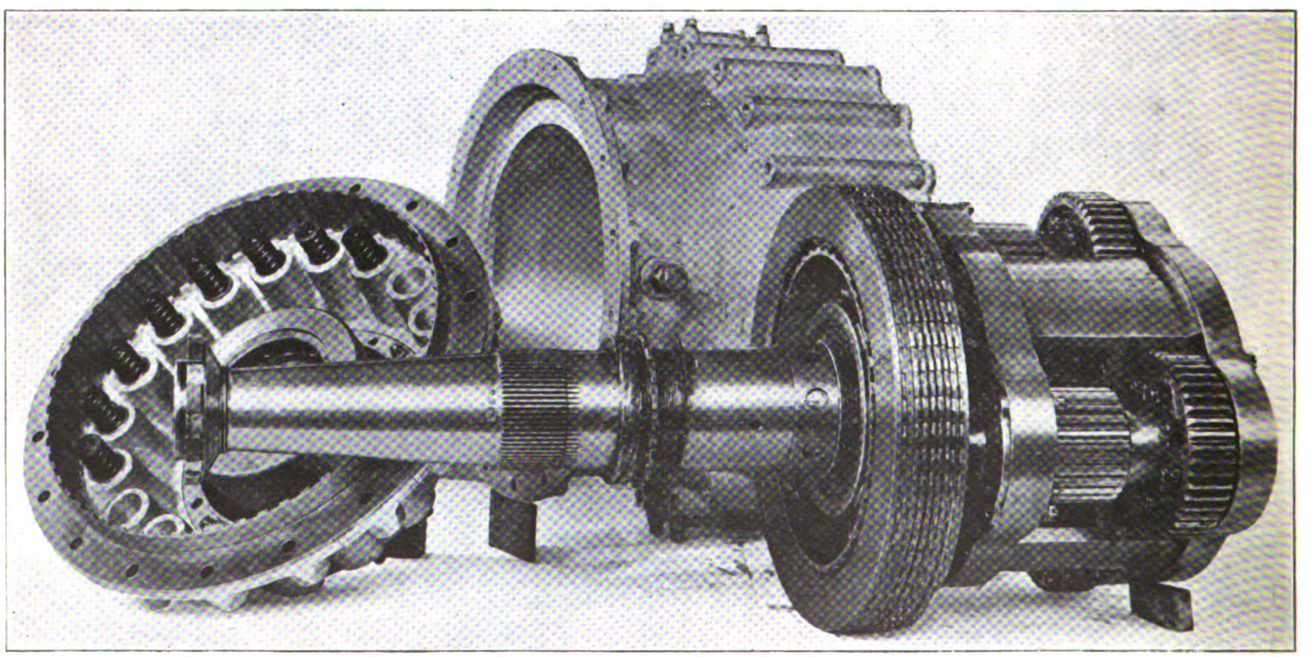
Crankshaft.

The six-throw crankshaft is machined from a nickel-chrome steel forging, all the journals and crankpins being bored for lightness and to convey lubricating oil to all bearings and connecting rods. All crankpins and journals are accurately ground to close limits for size and trueness of diameter. The crankshaft is carried in seven bearings of ample proportions.

Crankcase and Bearings.

The crankcase is of special aluminium alloy, and is made in two halves of box section, suitably ribbed to give the necessary stiffness.

The main bearings are held in the top half of the crankcase by means of nickel steel caps, these being held by long bolts which pass through the top half of the crankcase. The bearings are in halves and consist of phosphor bronze shells white metal lined.



The new Friction-held type of Rolls-Royce reduction gear.

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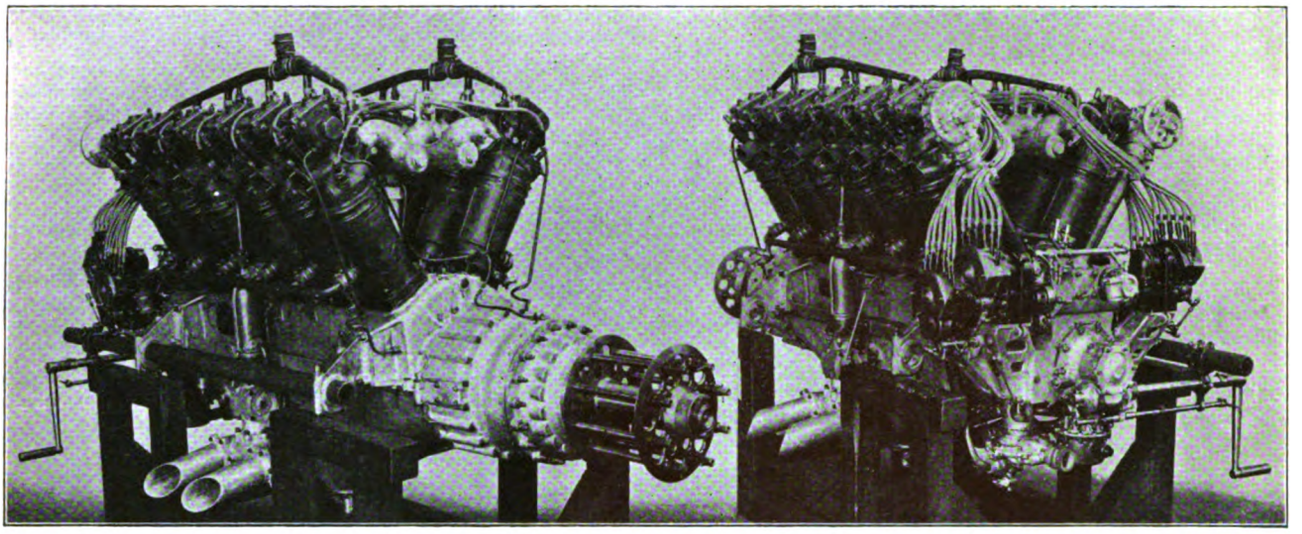
ROLLS-ROYCE——*continued.*



The Rolls-Royce "Eagle IX" of 370 h.p.

Reduction Gear.

A compound epicyclic reduction gear is fitted on the front end of the crankshaft through which is transmitted the drive to the propeller. The annulus driving gear is fixed on the flange of the crankshaft, which rotates the three sets of planet gears round the sunwheel. The latter is the fixed member of the gear and is prevented from rotating by means of a friction anchorage in the form of a multi-plate clutch, the plates being anchored to the casing and the sunwheel alternately, and pressed together by springs. This arrangement limits the maximum torque which may be imposed on the gears, the clutch being designed to slip if a certain torque is exceeded, due, for instance, to periodic stresses set up by propeller vibrations or pre-ignitions.

The gears and other wearing parts are machined from 5% case-hardening nickel steel. The planet gears run on ball or roller bearings and are mounted in nickel steel planet cages, which are bolted to the flange of the propeller shaft. The propeller shaft is made of nickel-chrome steel and supported at its inner end in a bearing mounted in the crankshaft, and the front end is carried in a roller bearing of ample proportions.

A double thrust ball bearing is contained in the front end of the epicyclic gear casing to take thrust from the propeller.

Propeller Hub.

The propeller hub is a 3½% nickel steel forging provided with internal serrations engaging similar serrations on the propeller shaft. To locate the hub radially and to secure it against any axial movement, two opposed tapers are utilised, one consisting of a split conical phosphor bronze ring on the propeller shaft, and the other of a conical nut on the extremity of the shaft, each engaging conical seats in the hub. The loose flange is fitted on serrations of the hub, the whole being provided with a number of hollow bolts which pass through the propeller.

Carburetter.

Two carburetters are provided, each supplying a group of six cylinders. They are of a special Rolls-Royce Claudel Hobson type, fitted with needle valve adjustment, by which the flow of petrol from float chamber to jet may be regulated from the pilot's seat to suit varying altitudes. Special compensating passages are provided in the carburetter, which maintain under all conditions the same pressure in the float chamber as in the throat, thereby neutralising eddy current effects. These passages also enable the float chamber cover to be sealed, thus reducing the risk of petrol leakage. In addition, drain pipes are arranged below each carburetter to drain away from the engine any petrol which may be spilt.

Induction Pipes.

The induction pipes are of large diameter, formed with easy bends and water-jacketted adjacent to each carburetter. Suitable nozzles are fitted in each of the manifolds for priming purposes.

Magnetos and Ignition System.

Four 6-terminal or two 12-terminal high-tension magnetos are fitted and are supported on the auxiliary gear case from which they are driven by means of serrated couplings. Incorporated in the latter is a device for enabling a fine and positive adjustment of the ignition timing to be effected. Two sparking plugs of approved make are fitted to each cylinder.

Water Circulating Pump and Cooling System.

A centrifugal water-circulating pump of ample capacity is fitted below the gearcase and driven from it through serrated couplings arranged to take care of movement due to expansion or want of alignment.

All water pipe connections consist of rubber joints with a special patented type of clip, allowing of ample flexibility.

Oil Pumps and Lubricating System.

The lubrication of the engine is arranged on the "dry sump" system, the bulk of the oil being carried in a service tank separate from the engine. The "scavenger" and "pressure" pumps are arranged as a unit, being bolted to the under side of the engine-timing gear case, and driven from the timing gear. The "scavenger" pump, which is of slightly greater capacity than the "pressure" pump, draws oil through the filter at the bottom of the engine sump, and delivers it to the service tank. The "pressure" pump draws oil from the service tank through a filter and delivers it to the main bearings, and other parts under suitable pressure.

A compound relief valve regulates the pressure in the main system and also adjusts the pressure of an auxiliary low pressure system which supplies oil to the hollow camshafts, their bearings and drive mechanism.

Control Mechanism.

The control mechanisms for ignition, throttle and mixture regulator are fitted on the engine, but connections between the engine and the pilot's seat are not provided by Rolls-Royce Ltd., being left to those responsible for the installation of the engine.

Revolution Counter and Air Pump.

An arrangement for driving a revolution counter is mounted on the timing-gear case, the connection being driven at one-quarter crankshaft speed. An air pump for supplying pressure to the fuel tank can be supplied as an extra, being also mounted on the timing-gear case and driven from the timing-gear.

Exhaust Manifolds.

These are fitted one on each side of the engine, being constructed of light sheet steel pressings acetylene welded together. Suitable union attachments are fitted for connecting the manifolds to light steel exhaust pipes.

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ROLLS-ROYCE—*continued.*

Engine Starting Gear.

An epicyclic hand starting gear is fitted on the timing-gear case. The starting handle may be arranged on either side of the engine to suit requirements, being supported from one of the engine bearers.

Priming of the induction pipes is effected by the Rolls-Royce Priming Device, supplied with each engine, which enables a highly atomised mixture of petrol and air to be injected into the induction pipes. This device is intended to be fitted near the pilot's seat, and connected to the induction pipes by copper tube, a length of which is supplied for the purpose.

Direction of Rotation.

The direction of rotation of the propeller is clockwise, as viewed from the propeller end of the engine.

The engines can be used as either "tractors" or "pushers"

Spanners, Tools and Spares.

A complete set of spanners suitable for carrying out any adjustments to the engine, together with a quantity of spare parts, are supplied in tool box with each engine. A set of special spanners and tools, such as are required for dismantling and erection, are supplied at an extra cost.

Materials.

All materials used in the construction of these engines are produced in exact conformity with Rolls-Royce Specifications, which are based on many years' experience with alloy steels and non-ferrous alloys. These specifications embody all the requirements of the standard specifications issued by the British Air Ministry, but are much narrower in their scope and demand greater freedom from impurities, also closely limit variations of heat-treatment.

All mild and alloy steels are carefully tested in the raw state, every bar and billet being proved by heat-treatment, fracture and Brinell test, to ensure that the raw material is correct to specification.

Each individual crankshaft and propeller shaft forging is tested separately. Camshafts, connecting rods, etc., are tested in batches, one forging being selected out of each batch of a specified number and after heat-treatment are required to pass the following tests :—

(*a*) Tensile (static).
(*b*) Stanton (fatigue).
(*c*) Izod Single Impact (heat-treatment test).

In the case of non-ferrous metals, tensile test pieces are taken from every large casting and from every main cast.

Testing of Engines.

All engines are tested in accordance with Schedule of Standard Production and Type Tests as laid down for Aircraft Engines by the Air Ministry, and are carried out under the supervision of a representative of the Aircraft Inspection Department.

These engines are of a type and design which have been approved by the Air Ministry, who issue Air-worthy Certificates after the engines have successfully completed the tests referred to.

THE ROLLS-ROYCE "EAGLE IX."

The Rolls-Royce "Eagle" engine has lately been modified, and is now known as the "Eagle IX."

This model has two carburetters, one on each side of the engine, and is fitted with friction anchorage and other improvements to the epicyclic gear. The rubber connections in the petrol system have been eliminated, and other minor alterations, suggested by the long experience in the use of this engine, have been embodied.

The leading particulars of the engine are as follows :—

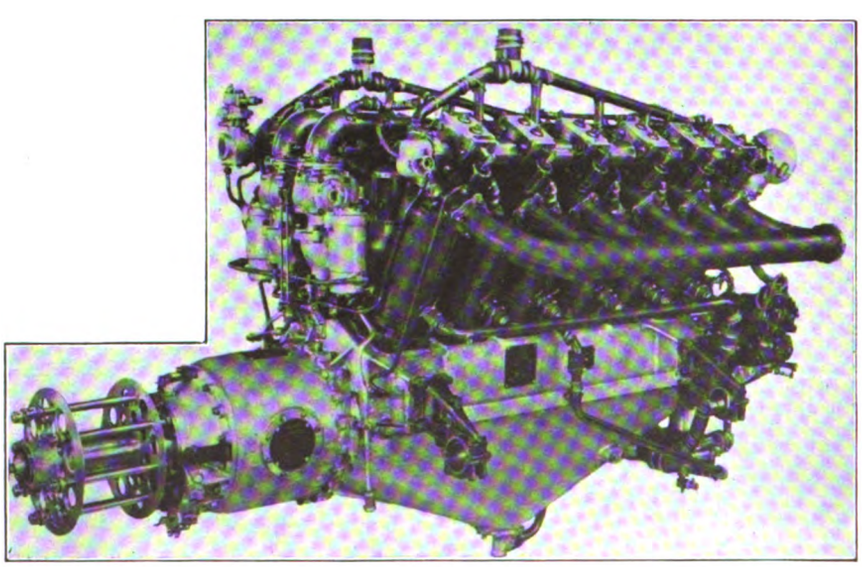
No. of cylinders	12.
Bore	$4\frac{1}{2}$ ins.
Stroke	$6\frac{1}{2}$ ins.
Normal b.h.p.	360.
Normal speed (crankshaft)	1,800 r.p.m
Maximum speed (crankshaft)	2,000 r.p.m.
Normal speed (propeller)	1,080 r.p.m.
Gear ratio	.60.
Petrol consumption on the ground, at normal b.h.p. and normal r.p.m. (gallons per hour)	25.
Oil consumption (gallons per hour)	1.
Weight, including reduction gear, airscrew boss exhaust pipe, etc.	965 lbs.

THE ROLLS-ROYCE "FALCON."

This engine, fitted with low compression pistons and with two 12-cylinder magnetos, is an exceeding satisfactory engine for the moderate size commercial aeroplane.

The leading particulars of the engine are as follows :—

No. of cylinders	12.
Bore	4 ins.
Stroke	$5\frac{3}{4}$ ins.
Normal b.h.p.	270.
Normal speed (crankshaft)	1,800 r.p.m.
Maximum speed (crankshaft)	2,000 r.p.m.
Normal speed (propeller)	1,061 r.p.m.
Gear ratio	$\frac{50}{95}$
Petrol consumption on the ground at normal b.h.p. and normal r.p.m. (galls. per hour)	18.
Oil consumption (galls. per hour)	$\frac{3}{4}$.
Weight, including reduction gear (This weight does not include radiator, water, fuel or oil.)	705 lbs.



The Rolls-Royce Falcon Engine, (260 h.p.,) showing the new Carburetter arrangement.

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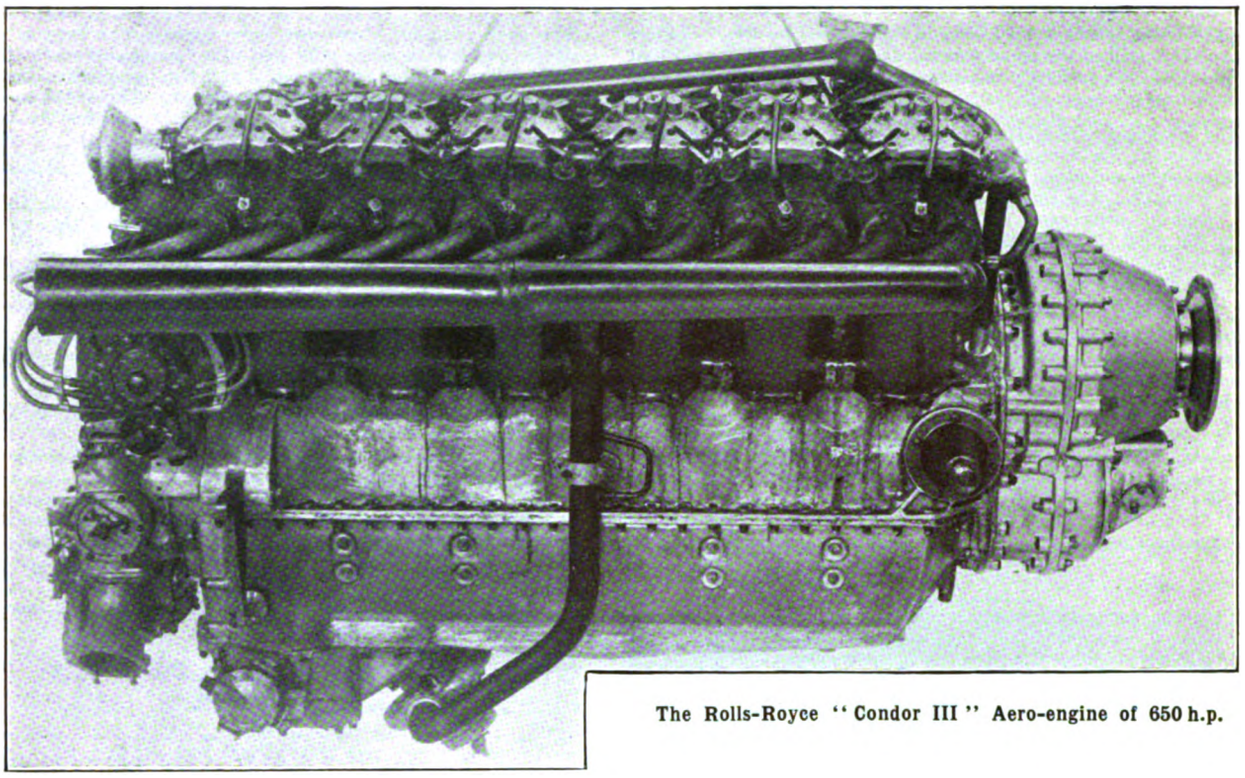
ROLLS ROYCE—*continued.*



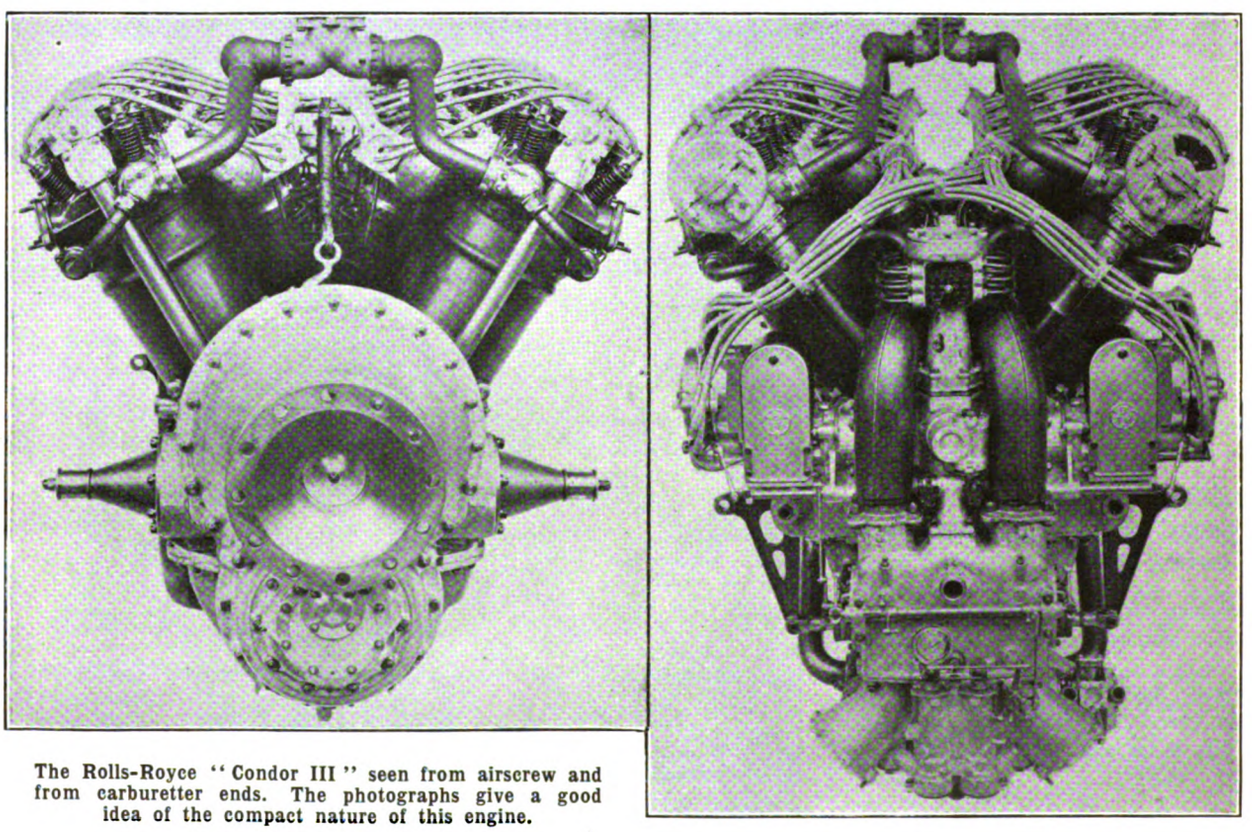
The Rolls-Royce "Condor III" Aero-engine of 650 h.p.

THE ROLLS-ROYCE "CONDOR III."

The "Condor" type of engine was originally designed towards the end of the War very largely to meet the need for an engine having the same quality of reliability as had been displayed by the Rolls-Royce "Falcon" and "Eagle" types, but of considerably greater power. The primary use to which it was intended to devote this type was the equipment of large, sea-going aircraft for Fleet co-operation purposes.

The original "Condor" engine followed very closely the design of the smaller "Falcon" and "Eagle" types of Rolls-Royce engine on an enlarged scale. The engine was designed to develop 550/600 h.p. instead of the 370 h.p. of the later "Eagle" engines, and the only notable apparent difference was in the provision of four valves per cylinder in place of the two valves which sufficed for the smaller types. It is understood that only a few of the original "Condor Series I" were produced, but it is known that these few showed that they possessed the characteristic reliability of the earlier types.

The "Series I" type was succeeded by the "Series Ia" in which by detail modifications and alterations the normal output at 1,900 r.p.m. was raised to 650 h.p. This engine gave an extremely good account of itself.



The Rolls-Royce "Condor III" seen from airscrew and from carburetter ends. The photographs give a good idea of the compact nature of this engine.

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ROLLS ROYCE—*continued.*

More recently this type has been superseded by the "Condor Series III," still of the same general design, developing a normal b.h.p. of 650 at 1,900 r.p.m., but weighing nearly 300 lbs. less than the earlier type.

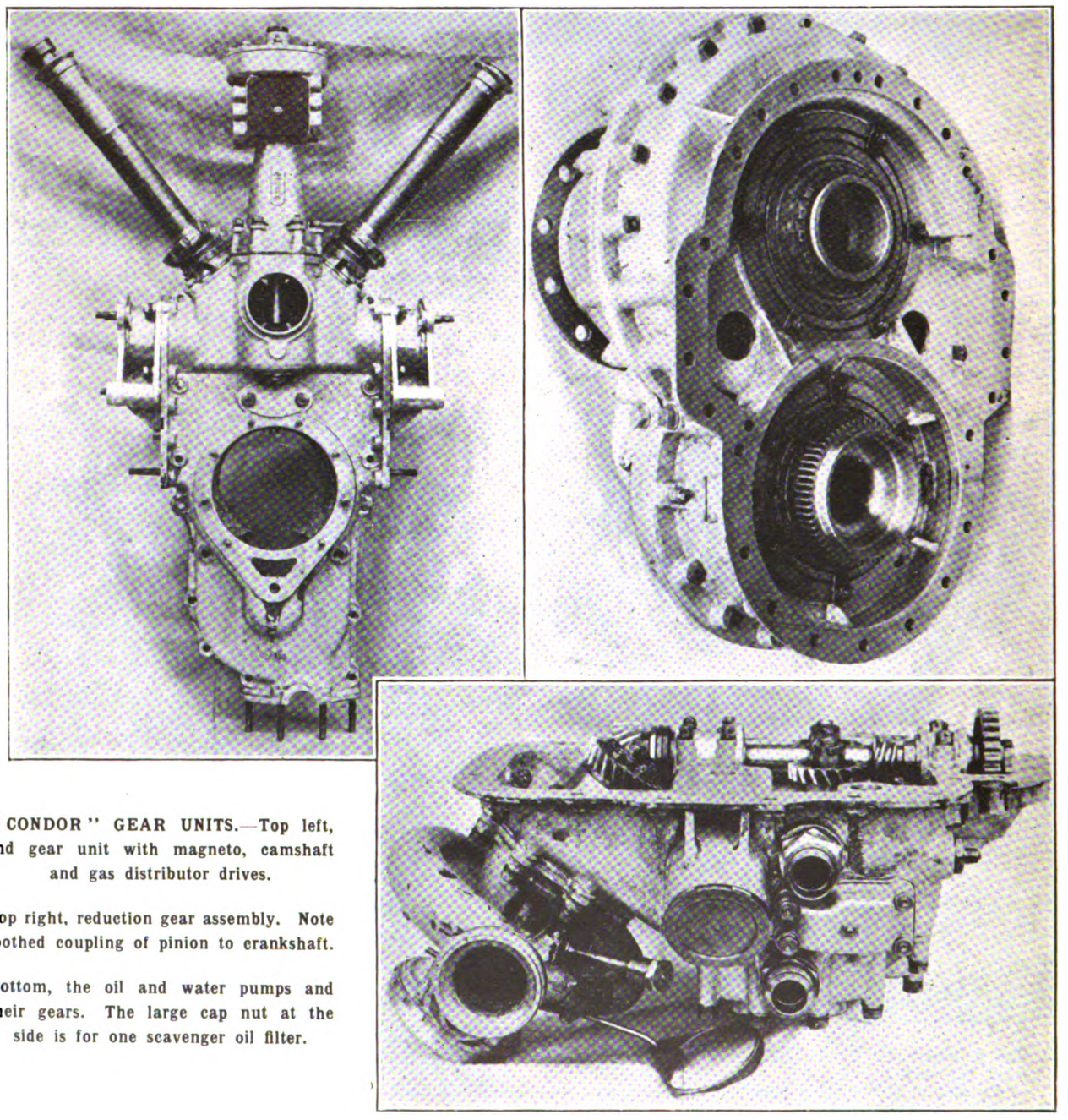
The "Condor Series III" engine has 12 cylinders mounted in two rows at an included angle of 60°. The cylinders are separately mounted on the crankcase, and are machined from steel forgings. The cylinder heads, valve seats and the bosses for sparking plugs and starter connections are all machined from the solid, thus avoiding a good deal of that promiscuous welding frequently to be found in cylinders of this general type. Valve ports are welded to the cylinder head, and are machined for the valve guide bushes *in situ*.

The cylinder jackets are formed of die pressed steel sheet, acetylene welded to the cylinder. Before the jackets are fitted the cylinders proper are zinc-coated to protect them from corrosion.

The overhead camshafts are carried in steel tubular cases, to which are brazed steel brackets bearing on the cylinder heads. The camshafts run in six split aluminium bearings and in two single-piece bearings, one at each end of the casing. The shafts and cams are machined from the solid, hardened, and ground on cam faces and bearing surfaces.

For each cylinder there are three cams. The central cam controls two rocker arms, the two outer cams one valve each. As the cylinder heads are spherical and the valve seats directly in the head, the valve stems are divergent. The valve rockers must swing in a plane parallel to one which contains the valve axis, and this plane cannot be at right angles to the camshaft axis. Any attempt to operate the valve rockers directly, or through rollers rigidly attached to the rockers, would therefore lead to lateral loads on the rocker arms. This difficulty is overcome by interposing between the cams and the rockers cylindrical tappets running in vertical guides in the camshaft casing boxes. These tappets are slotted at the appropriate angle for the rocker arm and the end of the rocker arm projects into the slot and is driven from the hardened face at the bottom of the slot.

The drive for the camshaft and for all auxiliaries is taken from a spur wheel at the rear end of the crankshaft. This pinion is fitted with the Rolls-Royce friction damped spring drive which relieves the whole of the gearing from the effects of torsional vibrations of the crankshaft. This pinion drives a short shaft parallel to and above the crankshaft and this drives through a skew gear a cross shaft which drives the magnetos, and through bevel gears two inclined shafts which in turn drive the camshafts also through bevels. A third vertical shaft



"CONDOR" GEAR UNITS.—Top left, end gear unit with magneto, camshaft and gas distributor drives.

Top right, reduction gear assembly. Note toothed coupling of pinion to crankshaft.

Bottom, the oil and water pumps and their gears. The large cap nut at the side is for one scavenger oil filter.

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ROLLS ROYCE—*continued.*

between the camshaft drives serves to operate the gas distributor for starting purposes. All shafts run in ball-bearings and are provided with hardened serrated couplings which allow of slight variations of alignment and length caused by expansion of the parts. The whole of this gear with its casing forms a detachable unit which is shown in a photograph.

Oil, water and petrol pumps, together with their gears, are arranged to form another detachable unit which is attached below the crankcase. These auxiliaries are driven from the same spur wheel on the crankshaft. The water pump, which is at the forward end of this unit, has its shaft inclined. Two vertical shafts drive three oil pumps—one a pressure pump and two scavengers—two of these three, the pressure and one scavenger, being arranged one above the other on the same shaft. Two large scavenger oil filters are carried in the casing, large castellated plug heads which project on each side, affording easy access to the gauzes.

A Briggs type petrol pump, which by itself forms a detachable unit, is spigot mounted on one side of the casing when this item is required.

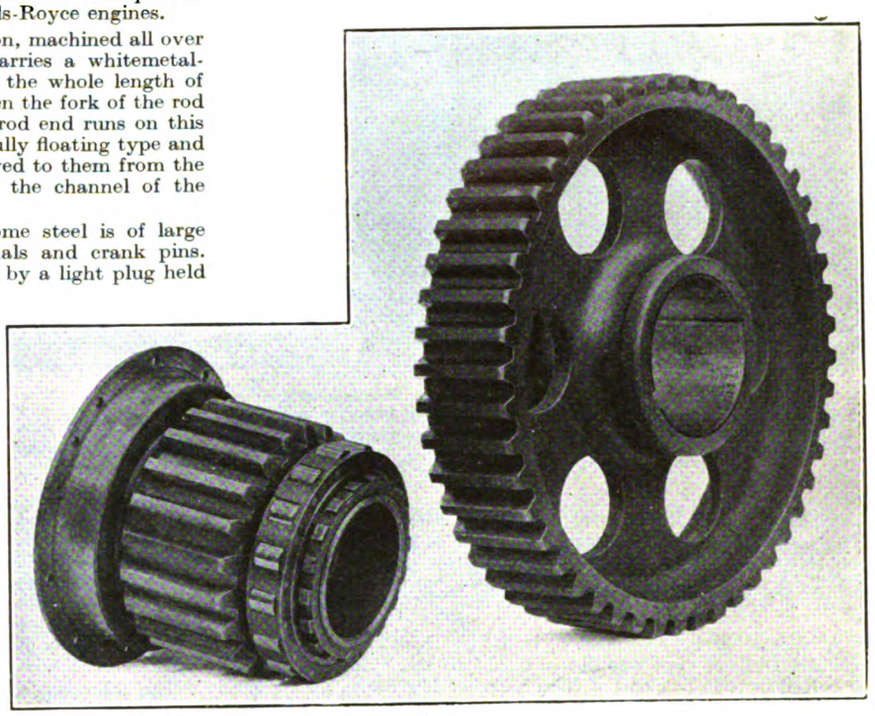
The pistons are of aluminium alloy, fitted with two narrow compression rings and one scraper ring above the gudgeon pin and also one scraper ring at the base of the skirt. The pistons are of the Zephyr type always used on Rolls-Royce engines.

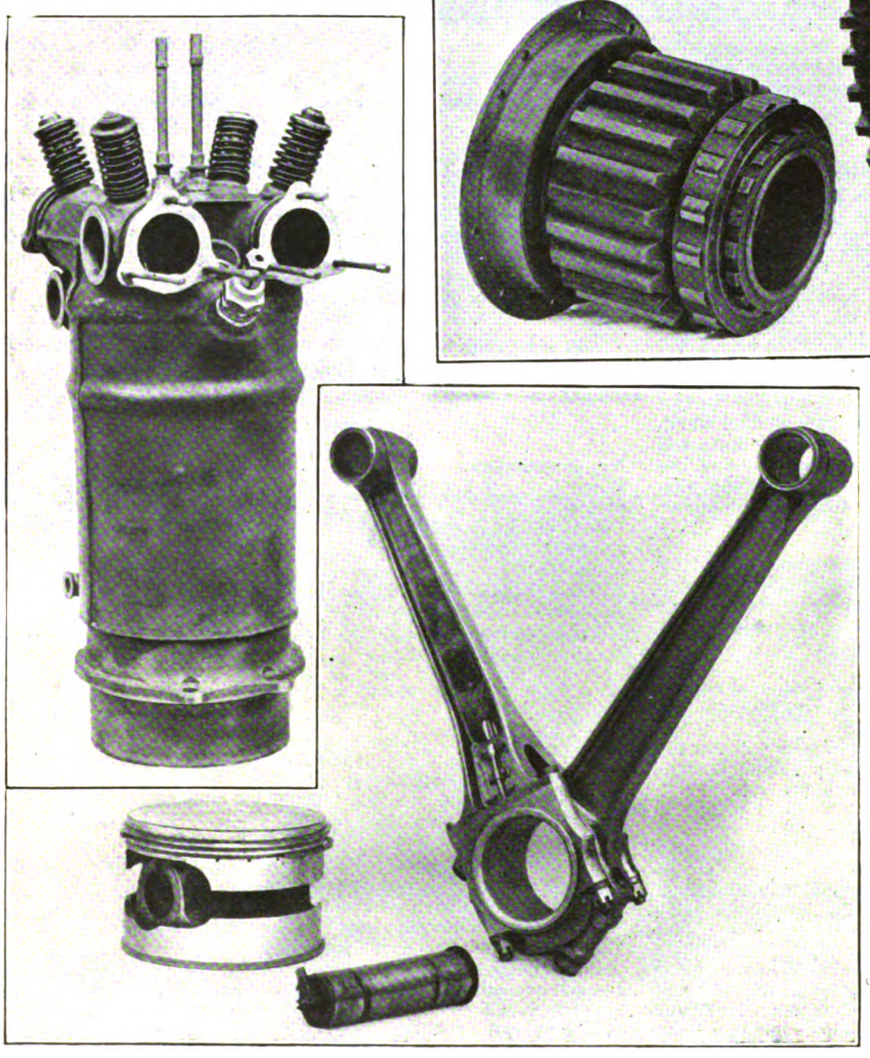
The connecting rods are of channel section, machined all over and of the forked type. The split rod carries a whitemetal-lined steel-block big-end which bears over the whole length of crank pin. This block is cylindrical between the fork of the rod and whitemetal covered, and the straight rod end runs on this surface. The little-end bushes are of the fully floating type and are lubricated under pressure by oil conveyed to them from the crankshaft through steel tubes carried in the channel of the connecting rods.

The six-throw crankshaft of nickel-chrome steel is of large diameter and bored throughout all journals and crank pins. The end of each section of boring is closed by a light plug held in place by long bolts passing through the shaft and making an oil-tight joint.

The crankcase is in two halves made of aluminium alloy split horizontally on the crankshaft centre line. It carries seven substantial crankshaft bearings, of which the two end ones are carried directly in the crankcase. The five intermediate bearings are carried in the lower half by steel bridges, each held into the crankcase by a pair of steel bolts, running right across the case. These bridges carry each two long vertical bolts, which in turn pass up through the top half of the crankcase and emerge between the two rows of cylinders. Loads on the crankshaft bearings are thus transmitted to the top crankcase casting, close up to the cylinder attachments, and the walls of the crankcase are thereby relieved of such stresses. The two end bearings, though not provided with steel bridges, have similar long vertical bolts.

The " Condor III " is fitted with a single spur reduction gear carried in a housing bolted to the end of the crankcase. In this respect this engine differs from both the earlier types of " Condor," and from all other Rolls-Royce models. The pinion is carried on a short shaft driven by a toothed wheel which floats in an internally toothed flange bolted to the crankshaft.





"CONDOR" COMPONENTS.—The photograph above shows the plain spur reduction gears used on the " Condor " engine. These gears are housed in a casing which locates and aligns the gears independently of the crankshaft, and the pinion is driven from the crankshaft by a floating coupling.

On the left is a complete cylinder, showing the four divergent valves. The sparking-plug-like object between the two valve ports is the starting gas connection.

Below and to the right of the cylinder a piston and gudgeon pin, and a connecting rod assembly.

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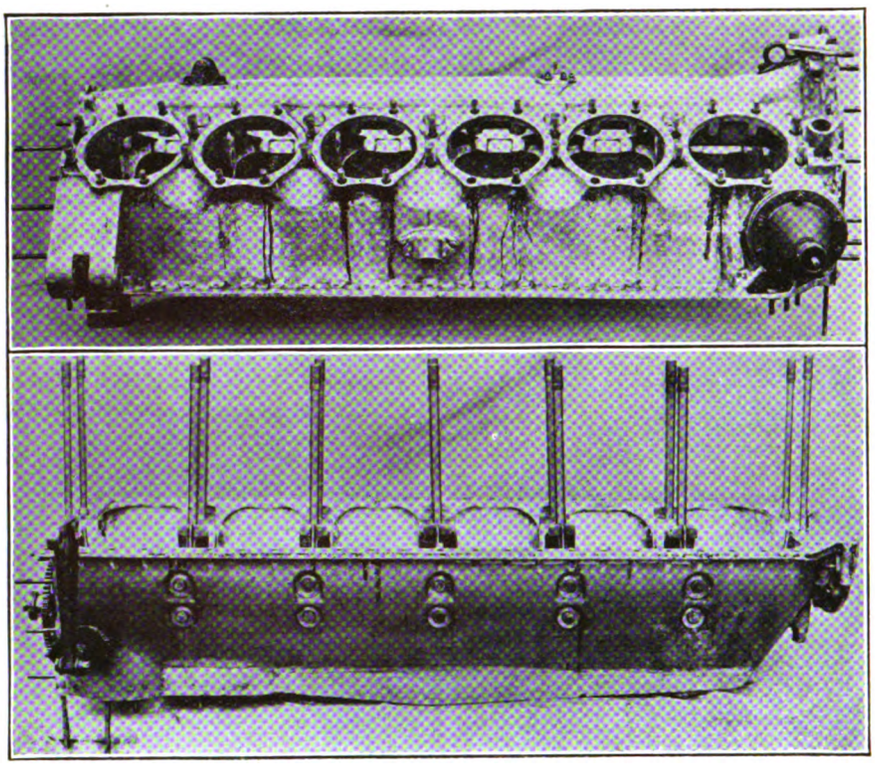
ROLLS ROYCE—*continued.*



THE "CONDOR" CRANKCASE.—In the bottom half the steel bearing bridges may just be seen and on the sides the heads of the bolts which hold these bridges into the crankcase. In the top half the faces for the long bearing bolt nuts can be seen between each cylinder base.

Note the suspension trunnion at the airscrew end of the lower half and the bracket for the suspension links at the other end. The link on the near side and the coupling rod which crosses the crankcase are on the end of the lower half-case.

Very large roller bearings are fitted to both the gear shafts. The airscrew shaft is of large diameter and is fitted with a flange to take the boss of a metal airscrew hub of the normal type. A separate unit containing gun control cam-gears is made to bolt into the reduction gear case if this is required.

A special twin carburetter, built by Rolls-Royce, of the Claudel Hobson type supplies mixture to the cylinders. This is bolted to the after end of the crankcase low down, giving the maximum possible head for gravity feed of petrol. A single central float chamber is used for both the carburetters, one of which feeds each row of six cylinders. A pair of mixture control valves, one for each side, gives a range of mixture control which is definitely fixed in the works and cannot thereafter be tampered with, except by intentional alteration of the dimensions of the valve passages. The control valves are of a rotating type with conical seatings and govern the rate of flow from float chamber to jet.

The carburetter float chamber and throat are connected by air-pressure compensating passages which prevent harmful eddy-current effects and also allow the use of a sealed float chamber cover. There is only one petrol connection to the engine, and no chance of petrol leakage from the float chamber.

Magneto and ignition control are coupled together in such a way that full advance of the magneto occurs at threequarter throttle opening and the ignition is then slightly retarded if the throttle is further opened. Also in its most closed position the throttle does not cut out the pilot jet and the engine cannot be stopped by accidental overuse of the throttle control.

In the latest type of carburetter an extra air valve is fitted, which automatically admits extra air above the throttle. By the use of this control the petrol consumption of the engine at cruising speeds is improved, in fact it is possible to maintain a petrol consumption of not more than 0.5 lbs. per b.h.p. hour over the whole useful throttle range.

No rubber joints of the usual type are employed in the water system. Where flexible connections are necessary, rubber rings in compression entirely enclosed in metal are employed. Water from the delivery side of the pumps enters the jacket at the heads of the third and fourth cylinder of each row and passes to the radiator from each end of the engine, also from the cylinder heads. The bottom of each cylinder jacket is connected to the bottom of the adjacent jackets, thus permitting convection flow between cylinders and providing means of drainage, but the main water circulation is directly along the cylinder heads where cooling is most necessary.

The following tabular statement gives the main data as to the dimensions, etc., of the Rolls-Royce "Condor III."

Specification.

No. of cylinders	12.
Bore	5½ ins. (140 m/m.).
Stroke	7½ ins. (190 m/m.).
Piston displacement	2,140 cub. ins. (35 litres).
Compression ratio	5.3/1.
Normal output	650/670 h.p.
Normal crankshaft r.p.m.	1,900.
Reduction gear ratio	.477/1.
Normal airscrew r.p.m.	907.
Maximum output	700/720 h.p. at 2,100 r.p.m. crankshaft (1,002 airscrew).
B.M.E.P.	132 lbs./sq. in. (9.3 kgs./sq. cm.).
Piston speed	2,370 ft. per min.
Fuel consumption at normal putput	40/45 galls. (88-100 litres) per hour.
Fuel consumption per b.h.p. hour	.5 to .56 pints (.22 to .25 kgs.).
Oil consumption	1 gall. (2.2 litres) per hour
Weight, including carburetters, magnetos, starter distributor and pipes, but without reduction gear	1,154 lbs. (526 kgs.).
Weight as above, but including reduction gear	1,310 lbs. (596 kgs.).
Length overall	69.325 ins. (1.76 m.).
Height overall	42 ins. (1.065 m.) (appr.).
Width overall	30.525 ins. (0.778 m.).

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SUNBEAM.

THE SUNBEAM MOTOR CAR Co., Ltd., Wolverhampton.

Having now reverted to peace conditions, the Sunbeam Co. have devoted their aero-engine activities to the production of a range of four engines, as follows :—

"Dyak"	100 h.p.
"Manitou"	300 h.p.
"Matabele"	420 h.p.
"Sikh"	800 h.p.

All these engines are composed of similar materials for similar parts, with one exception, which will be noted later. The crankshafts are of nickel chrome steel, the pistons being of aluminium. The valves are of high chrome steel, of a special form and designed to withstand heat and prevent distortion, and the valve gearing is of self-hardened nickel chrome steel. The cylinder blocks, with the exception of the "Sikh" engine, are of aluminium casting with very large water circulation spaces and inspection covers. The cylinders are fitted with steel liners and the valve seats are of bronze. In the case of the "Sikh" engine, however, the cylinders are composed of steel throughout, and are welded together with their jackets.

The crankcases are in each case of aluminium casting and are of a patent form, designed to give greater strength and to allow the bearing caps to take a large share of the side load imposed on the crankshaft under the usual working stresses.

All these engines are of the water-cooled type, the circulation being in each case by centrifugal pump designed to give a specially large output. Lubrication in all types is by gear wheel pumps, three of these being employed :—

(a) A scavenger pump which draws the oil from the sump and returns it to the oil tank ;

(b) The main force pump which forces oil through the drilled crankshafts and ducts in the crankwebs to the main bearings, drawing direct from the oil tank ;

(c) The auxiliary oil circuit pump which forms a portion of the main force pump and is arranged to deliver the necessary quantity of oil at a very low pressure to the camshaft bearings and all auxiliary bearings.

Carburation is effected by Claudel-Hobson carburetters of diffuser type working under a head pressure of 4 lb. per square inch.

Ignition is by high tension magnetos, and particulars as to the number of these are given in the details of each engine.

The magneto drive is by a coupling formed of laminated spring blades giving great flexibility and ensuring a long life for the magneto.

The "Dyak," "Manitou" and "Matabele" engines are each fitted with two sparking plugs per cylinder, the "Sikh" engine being fitted with four plugs per cylinder.

The Sunbeam Coatalen engines are also manufactured in France, under licence by the Société Darracq, at Suresnes (Seine).

THE 100 H.P. "DYAK."

In the case of the "Dyak" 100 h.p., the engine is of the vertical type, the six cylinders being cast *en bloc* in aluminium. There are two valves to each cylinder, operated by one overhead camshaft, which is driven direct by bevel gearing to the crankshaft. This is carried on seven die cast white metal bearings. and drives the propeller direct, the thrust bearing being mounted on an extension of the crankcase. The carburetter is of the B.Z.S. 38 type, and is arranged for gravity feed. The starting of this engine is effected by hand.

The chief dimensions are as follows :—

Bore	120 m/m.
Stroke	130 m/m.
Total stroke volume of cylinders ..	8,820.5 c/c.
Normal speed of engine	1,200 r.p.m.
Fuel consumption	0.54 pint per b.h p. hour.
Weight of engine "dry"	399 lbs.

THE 300 H.P. "MANITOU."

The "Manitou" 300 h.p. is a 12-cylinder engine, the cylinders being cast in blocks of three and disposed on the crankcase in two rows of six each, the angle of inclination being 60 degrees. There are two inlets and two exhaust valves actuated by overhead camshafts, these being driven by trains of gears from the crankshaft. The connecting rods are of the usual "H" section and of the articulated pattern. The hollow crankshaft is carried on eight die cast white metal bearings, and the propeller is driven indirectly by gearing to the propeller shaft, which, with the thrust bearing, is mounted on an extension of the crankcase cast on the engine.

Carburation is by two Claudel-Hobson H.C.7 carburetters arranged for gravity feed and set in the centre of the "Vee." The magnetos employed are two of the B.T.H. A.V.12 type, driven from the trains of gears at one and a half times engine speed. Both electric and hand starters are fitted to this engine.

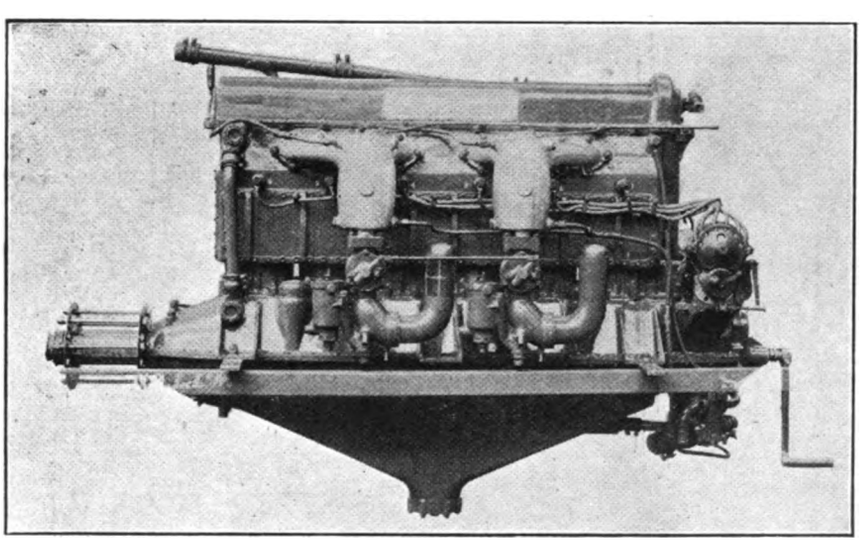
The chief dimensions are as follows :—

Bore	110 m/m.
Stroke	135 m/m.
Total stroke volume	15,395 c/c.
Normal speed of engine	2,000 r.p.m.
Fuel consumption	0.54 pint per b.h.p. hour.
Ratio of reduction	1.57 to 1.
Weight of engine "dry"	845 lbs.

THE 400 H.P. "MATABELE."

The "Matabele" 400 h.p. engine is similar to the "Manitou" with regard to the general lay out, the cylinders being similarly cast and disposed on the crankcase. The valves are likewise four in number (two inlet and two exhaust), and the valve gearing is exactly similar to that of the above-mentioned engine.

The propeller drive is indirect, the gear reduction, ratio being in this case 1.63 to 1. Carburation is by means of two Claudel Hobson H.C.7 (twin type) carburetters arranged for gravity feed, and ignition is effected by means of four P.M. 6 magnetos driven from the trains of gears. In this engine the starting is either by compressed air or by the hand starter.



The Sunbeam "Dyak" (100 h.p.)

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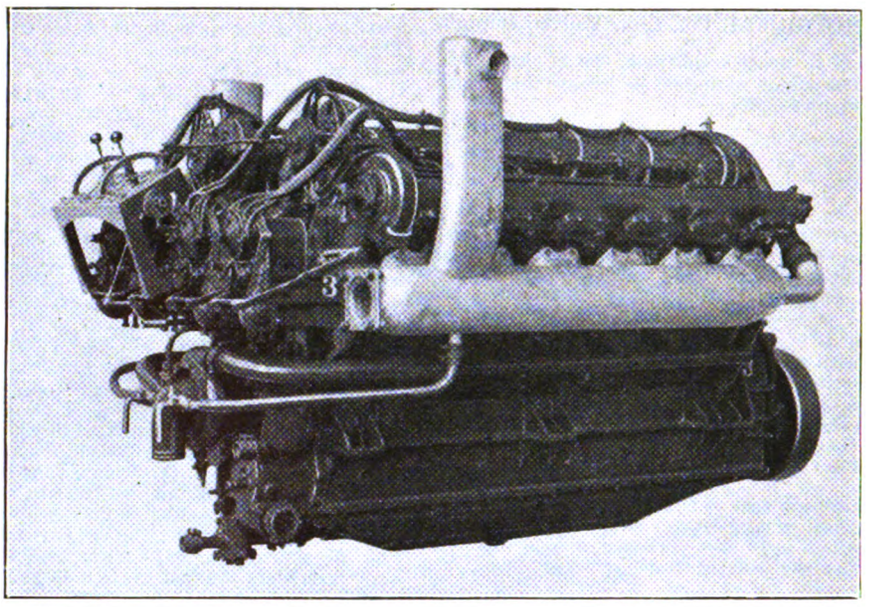


The Sunbeam "Matabele" (400 h.p.)

The chief dimensions are :—

Bore	122 m/m.
Stroke	160 m/m.
Total stroke volume	22,429 c/c.
Normal revolutions	2,000 r.p.m.
Fuel consumption	0.54 pint per b.h.p. hour.
Weight of engine "dry"	1,000 lbs.

THE 800 H.P. "SIKH."

The "Sikh" engine differs considerably from the other three. It has twelve separate steel cylinders, machined all over, and welded together with their jackets, the disposition on the crankcase being the same as in the smaller twelve-cylinder types. There are three inlet and three exhaust valves to each cylinder.

The valves are operated by push rods and rockers, actuated by a single central camshaft, driven, as usual, from the trains of gears. Eight die cast white metal bearings carry the hollow crankshaft, and the propeller shaft is driven indirectly by spur gear, the thrust bearing being mounted on an extension of the crankcase cast on the engine.

Carburation is effected by means of four Sunbeam Claudel carburetters of special form, two being situated at each end of the engine. Ignition is by four twelve-cylinder magnetos driven by skew gear and fitted with Vernier type coupling to allow of fine adjustment. Both hand and electric starters are fitted to this engine.

The chief dimensions are as follows :—

Bore	180 mm.
Stroke	210 mm.
Total stroke volume	64,113.6 cc.
Normal speed of engine	1,400 r.p.m.
Fuel consumption	0.51 pint per b.h.p. hour.
Ratio of reduction	1.526 to 1.
Weight of engine "dry"	1,952 lbs.

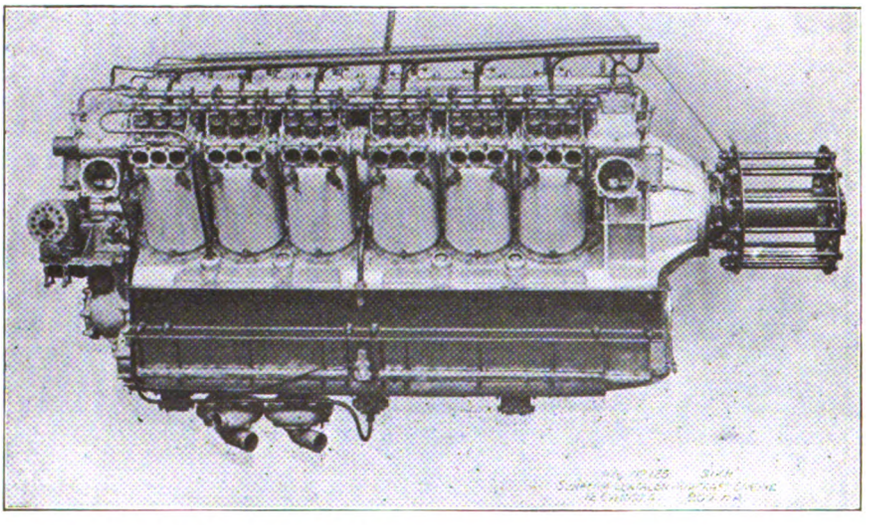
WOLSELEY.

WOLSELEY MOTORS, Ltd. (Proprietors: **Vickers, Ltd**). Head Office: Adderley Park, Birmingham.

London Office: York Street, Westminster.

No further details beyond those published in the 1919 edition of "All the World's Aircraft" are to hand.

The Wolseley "Viper" is still in use and gives excellent service, but is no longer manufactured.



The Sunbeam "Sikh" (800 h.p.).

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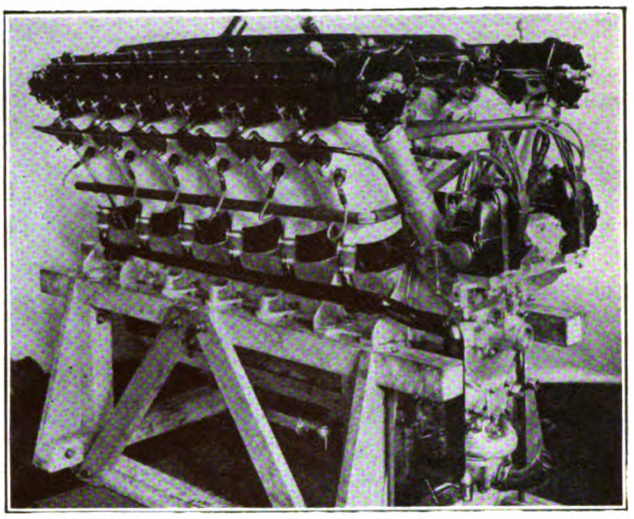
CZECHO-SLOVAKIAN ENGINES.

BREITFELD DANEK.

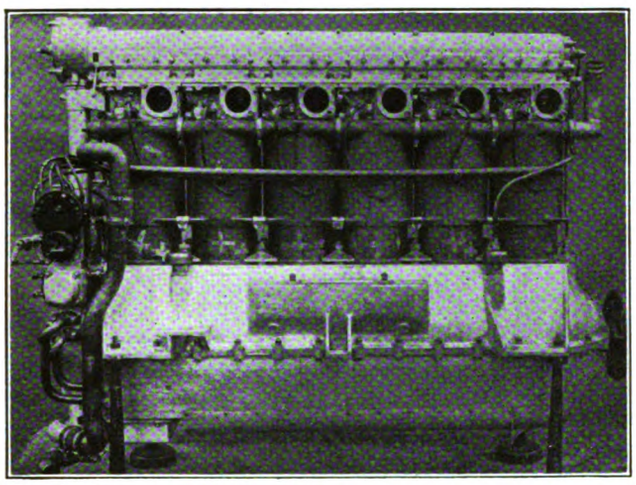
BREITFELD DANEK & CO., Karlin, Prague.

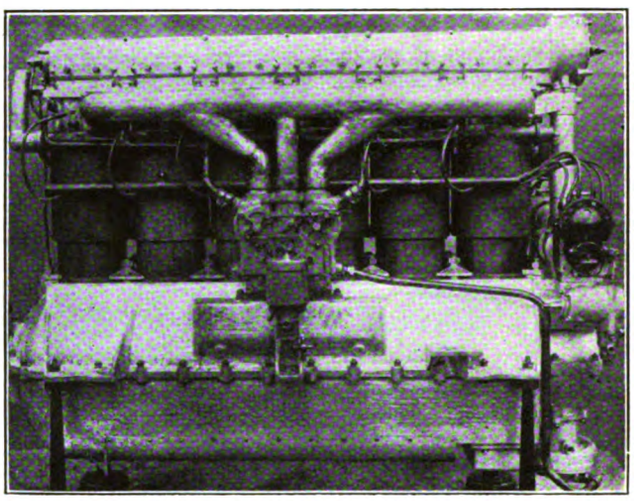
This firm has built aero-engines since 1915, mostly under licence from the now defunct Hiero concern. Recently they have started constructing engines of original design, which is however very largely influenced by German practice. They are at present producing four types of water-cooled engines, the dimensions, etc., whereof are tabulated below. The three larger engines are of the super-compressed type.

Type name ..	Blesk.	Perun I.	Perun II.	B.D.
Type	6-cylinder vertical.	6-cylinder vertical.	6-cylinder vertical.	12-cylinder 60° V.
Bore	120 m/m.	150 m/m.	160 m/m.	160 m/m.
Stroke	140 m/m.	180 m/m.	190 m/m.	190 m/m.
Normal r.p.m...	1,400.	1,400.	1,400.	1,400.
Normal h.p. ..	100.	180.	240.	450.
Weight dry, kgs.	205.	285.	305.	550.
Fuel consumption (kgs./h.p.) ..	.23.	.195.	.195.	.195.



The Breitfeld-Danek 450 h.p. aero-engine known as the " B.D."





Two views of the Breitfeld-Danek super-compressed " Perun II " engine of 240 h.p.

SKODA.

SKODOVY ZAVODY, Plzen.

The famous Skoda works, which were the principal armament manufacturers of the late Austrian Empire, manufacture Hispano-Suiza engines under licence.

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WALTER.

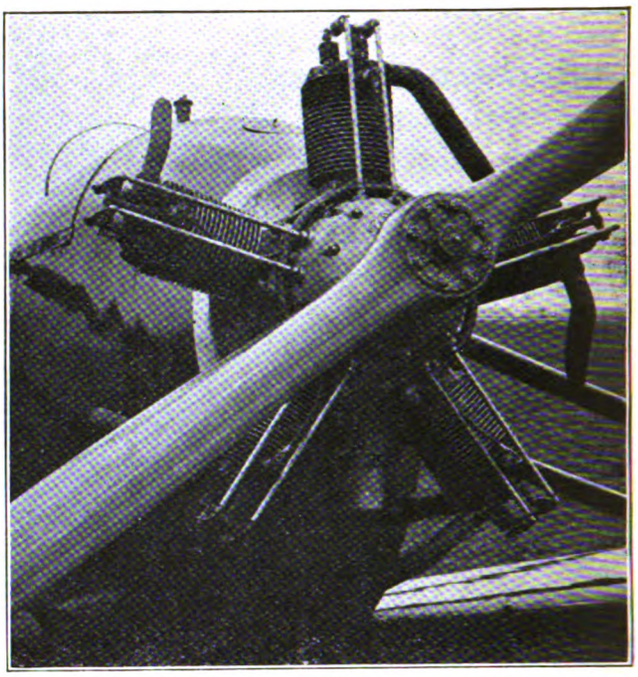
J. WALTER & CO., Praha-Jinonice.

This firm have constructed a 5-cylinder air-cooled radial engine of 60 h.p., somewhat like the Siemens Halske engine of similar rating. The engine has steel cylinders, which are zinc-coated and then have aluminium fins cast on. The cylinder head is of cast iron and detachable. Twin "Scintilla" magnetos and a Solex carburettor are fitted.

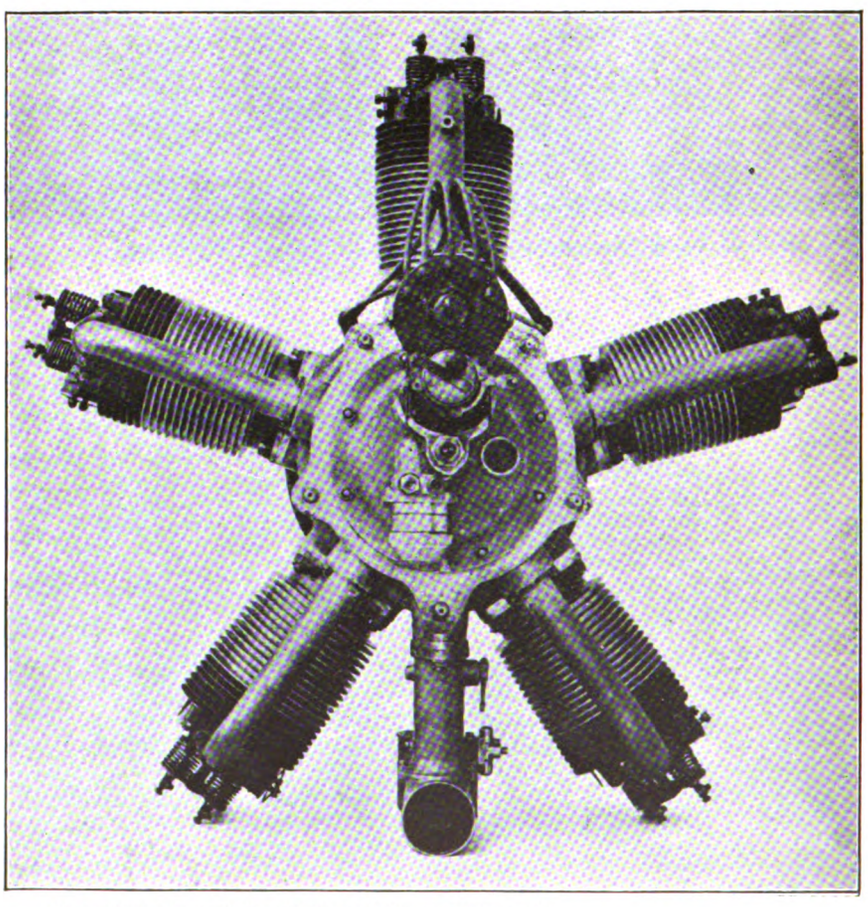
Specification of the Walter 60 h.p. Radial.

No. of cylinders	5.
Bore	105 m/m.
Stroke	120 m/m.
Normal r.p.m.	1,400.
Normal output	60 h.p.
Weight	100 kgs. (220 lbs.).
Petrol consumption	.23 kgs. (.51 lbs.) per h.p. hour.

The firm also build two engines, which are practically copies of the German B.M.W., one with cylinders 160 × 190 m/m., rated at 240 h.p. at 1,400 r.p.m., the other 150 × 180 m/m. and rated at 220 h.p. at 1,400 r.p.m.



The 60 h.p. Walter radial engine mounted in the Avia B.H.9 monoplane.



After End View of the Walter 60 h.p. radial engine.

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FRENCH ENGINES.

ANZANI.

A. ANZANI, Rue Paul Bert, Courbevoie.

This old-established firm continue the manufacture of their well-known radial engines in the sizes set forth below.

20-CYLINDER WATER-COOLED TYPE.

Bore	140 m/m.
Stroke	150 m/m.
Weight	550 kgs. (1,210 lbs.).

This engine consists of ten blocks, each of two cylinders, set round a common crankshaft. The blocks appear to be of aluminium of somewhat similar form to the Hispano-Suiza type, and a short overhead camshaft operates the valves of each block.

10-CYLINDER AIR-COOLED TYPES.

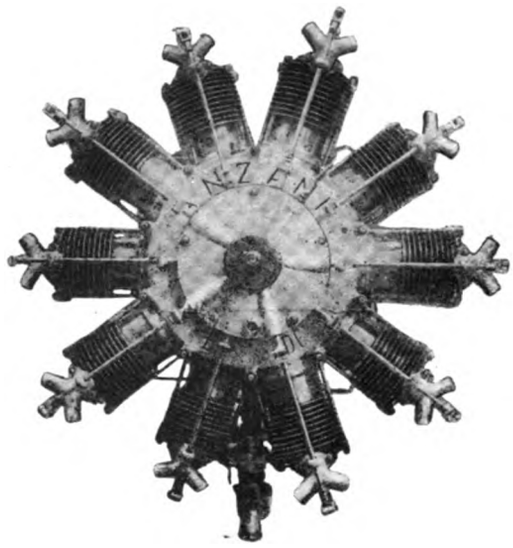
	(1)	(2)	(3)	(4)
Bore	125 m/m.	115 m/m.	105 m/m.	105 m/m.
Stroke	175 m/m.	150 m/m.	145 m/m.	125 m/m.
Weight ..	249 kgs. (548 lbs.).	180 kgs. (396 lbs.).	175 kgs. (385 lbs.).	141 kgs. (310 lbs.).

6-CYLINDER AIR-COOLED TYPES.

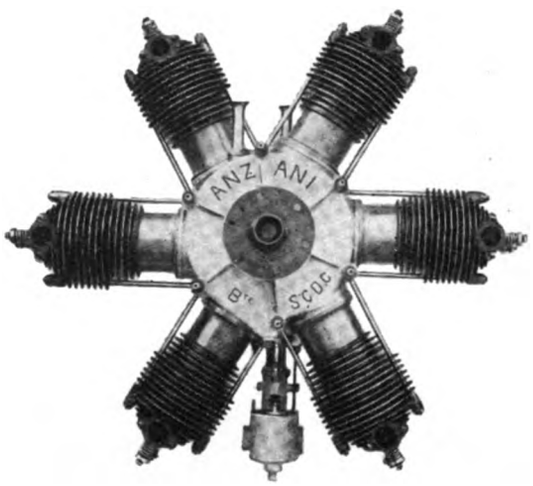
	(1)	(2)	(3)
Bore ..	105 m/m.	90 m/m.	90 m/m.
Stroke ..	125 m/m.	125 m/m.	120 m/m.
Weight	92 kgs. (202 lbs.).	78 kgs. (162 lbs.).	75 kgs. (165 lbs.).

3-CYLINDER AIR-COOLED TYPES.

	(1)	(2)
Bore	105 m/m.	90 m/m.
Stroke	120 m/m.	120 m/m.
Weight	60 kgs. (132 lbs.).	50 kgs. (110 lbs.).



The 100-110 h.p. Anzani engine. 10 cylinders.



Front view of the 45 h.p. Anzani engine, 6 cylinders.

BRÉGUET-BUGATTI.

SOCIÉTÉ ANONYME DES ATELIERS D'AVIATION LOUIS BRÉGUET, Rue de la Pompe 115, Paris (16e) et Velizy-Villacoubley.

The Bréguet-Bugatti multiple power plant described at length in the last volume of this work does not appear to have achieved success, nor has the Bréguet version of the single Bugatti unit made any serious progress.

The firm are, however, still experimenting with engines, but no data as to their more recent efforts is to hand.

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CLERGÊT.

France :--CLERGÈT BLIN ET CIE, 37, Rue Cavé, Levallois (Seine).

THE CLERGÊT ENGINE.

This successful engine of the rotary type is the outcome of years of investigation and experiment carried out by the firm of Clergêt Blin & Cie, of Paris, who. working from the lesser to the greater, have successively perfected more and more powerful models.

No new models have been produced since the war.

COATALEN.

SOCIÉTÉ ANONYME DARRACQ, 35, Quai du Général Gallieni, Suresnes (Seine).

This firm has acquired the rights for France of the well-known Coatalen engines, built in England by the Sunbeam Motor Car Co.

The range of engines manufactured is precisely the same as that built by the Sunbeam firm, to which reference should be made for data and description.

FARMAN.

SOCIÉTÉ DES AVIONS H. et M. FARMAN, Rue de Silly, 167, Billancourt Seine.

The Farman firm—like other aircraft firms in other countries—has found it prudent to turn its attention to branches of construction other than that of aeroplanes.

Unlike some firms in some countries, however, it has—far from abandoning aircraft work entirely—begun upon a fresh branch of the aircraft industry, as well as devoting some of its attention and resources to other products.

The new branch of their aircraft business is none other than the manufacture of aero engines.

The Farman engines have been designed with an eye to the demands of civil aviation, and the need for a power plant capable of continuous hard work. They are built in two sizes, both on similar lines.

The following general description relates to both sizes. The cylinders—entirely of steel—are in blocks of two with a common steel sheet-jacket welded on to each pair.

They are arranged in three rows, broad arrow fashion, on the crankcase.

The crankshaft is carried in bearings of ample surface, white metal lined. Connecting rods are of high tensile steel, and the pistons, fitted each with four rings, are of aluminium alloy.

The crankshaft ends in a disc fitted with driving dogs, to which may be bolted either the airscrew shaft, or the driving end of a reduction gear. This reduction gear is a kind of an epicyclic gear, with bevel planet wheels, and the gear case and shaft is interchangeable with the direct drive shaft.

The valves are overhead, push rod operated from a camshaft in the centre of the Vee, driven through a train of gears from the airscrew end of the crankshaft.

The pinion on the crankshaft for the camshaft drive meshes also with a pinion at the bottom of the crank-chamber which drives the oil and the water pumps.

From the end of the camshaft at the airscrew end a cross shaft is driven, carrying at one end a magneto, and at the other end a high tension distributor for a battery and coil ignition system.

Lubrication is on the dry-sump system. The oil pump is of the multiple piston type, and draws oil from both ends of the crankcase and passes it to an oil cooler built in the bottom of the crankcase. A special valve is interposed in this oil pipe line to allow the insertion of an oil radiator for use in hot climates.

Oil is drawn from the base cooler and forced to all bearings. An oil filter, which can be short-circuited and withdrawn for cleaning while the motor is running, is fitted on the delivery side of the oil pump. A pressure regulating valve is fitted to maintain a constant oil pressure.

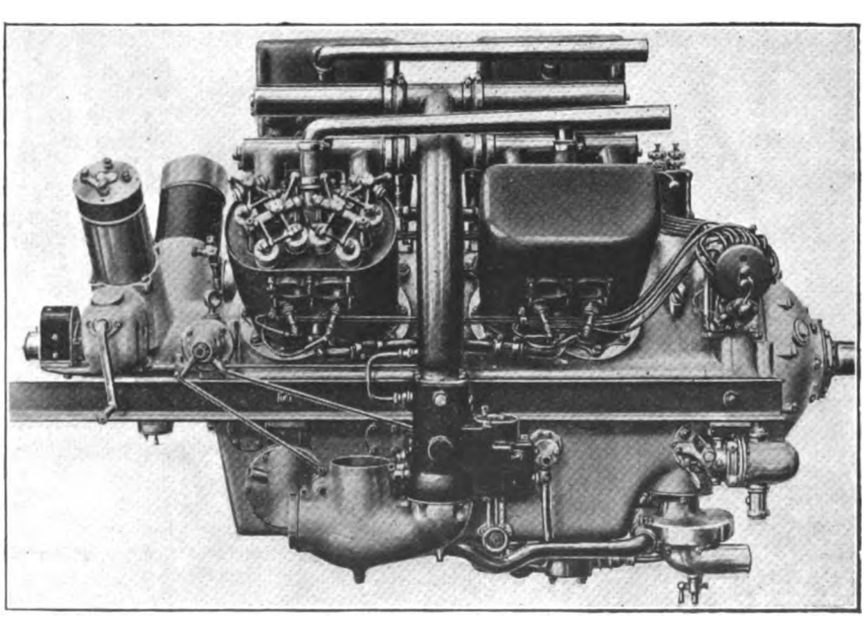
Cooling water is circulated by a centrifugal pump. A water throttling device is fitted in the circulation system and allows the rate of circulation to be adjusted and thus maintains a satisfactory water temperature even at great altitudes. Connections are fitted to allow of water being drawn from the circulation system for warming the passengers, etc.

Carburetters are fitted on the sides of the crankcase, and draw air through the oil-cooler. The induction pipes are water jacketed on their way to the cylinders. An altitude regulator is fitted on each carburetter.

Each engine is fitted with a dynamo, which supplies current to charge a battery of accumulators, which, in turn, can drive the dynamo as a starting motor and supply current for ignition, for lighting, and for wireless

The two engines are known as the type 18W.D. and the type 12W.D., the former 18-cylinders of 600 h.p., and the latter a 12-cylinder unit of 400 h.p.

The engines are fitted with a curious bevel reduction gear, which can be built to a wide range of speed ratios.



The Farman 12W.D. engine of 400 h.p.

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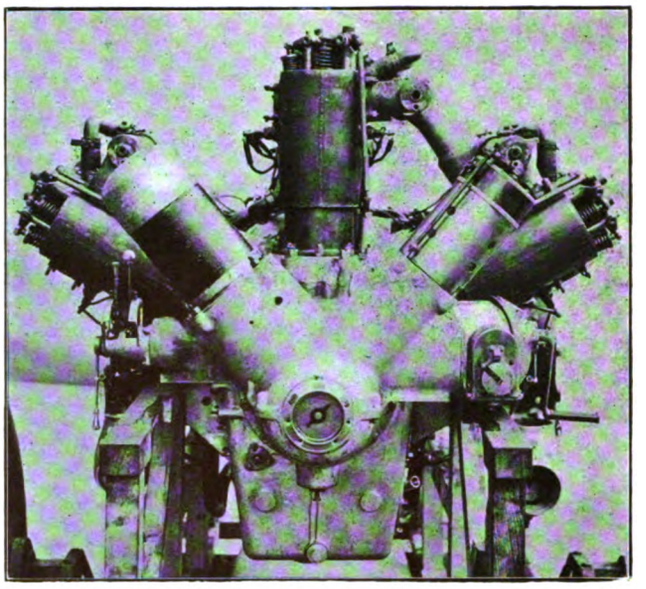
FARMAN—*continued.*

The 12 cylinder model has performed very satisfactorily on test, the 18 cylinder version seems to be still undergoing extensive trial.

Specification of the Farman Engines.

	Type 18W.D.	Type 12W.D.
No. of cylinders ..	18.	12.
Bore	130 m/m.	130 m/m.
Stroke	180 m/m.	160 m/m.
Angle between cylinder rows	40°.	40°.
Cylinder capacity ..	43.4 litres	25.4 litres.
Normal b.h.p. (1,450 r.p.m.)	600 h.p	400 h.p.
Maximum b.h.p. ..	800 (2,100 r.p.m.)	520 (2,200 r.p.m.).
Weight complete, with wireless, lighting and starting generators and motors	900 kgs	560 kgs.
Fuel consumption per h.p. hour ..	230 grams.	220 grams.



The Farman type 18W.D. of 600 h.p. in end view.

GNÔME & RHÔNE.

SOCIÈTE DES MOTEURS GNÔME ET RHÔNE, Rue La Boétie 41, Paris.

The Gnôme engines are apparently no longer being produced. The 80 and 110 h.p. Le Rhône types are still in use in a fair number of aircraft. Two new type Le Rhône engines have appeared since the end of the war.

During 1922, the firm acquired a licence to build the Bristol "Jupiter" air-cooled radial in France (See Bristol, British Engine Section).

THE TYPE R LE RHÔNE.

The Type R. 180-h.p. Rhône follows upon the lines of the well-known earlier models in general arrangement and valve gear.

The cylinders are of steel, with a cast-iron liner pressed in, the two valves are overhead, and are operated by one push-and-pull rod to each cylinder in the manner usual to this mark.

It is characterised by the fact that the carburetted mixture passes via the crankshaft to a sealed chamber in the rear end of the crankcase and thence by induction pipes to the inlet valves, and that the crankcase proper is kept free from mixture and is cooled by air which enters through the airscrew boss.

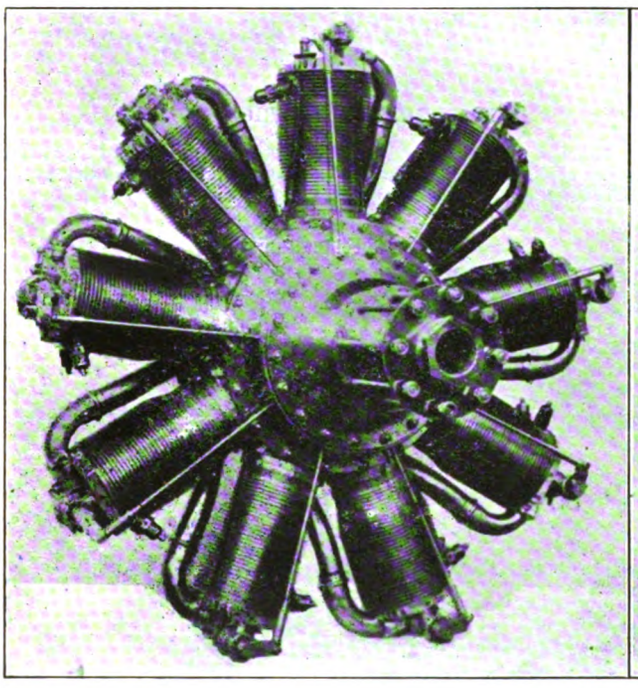
The crankcase cooling vents originally fitted have now been suppressed.

The general particulars of this motor are :—

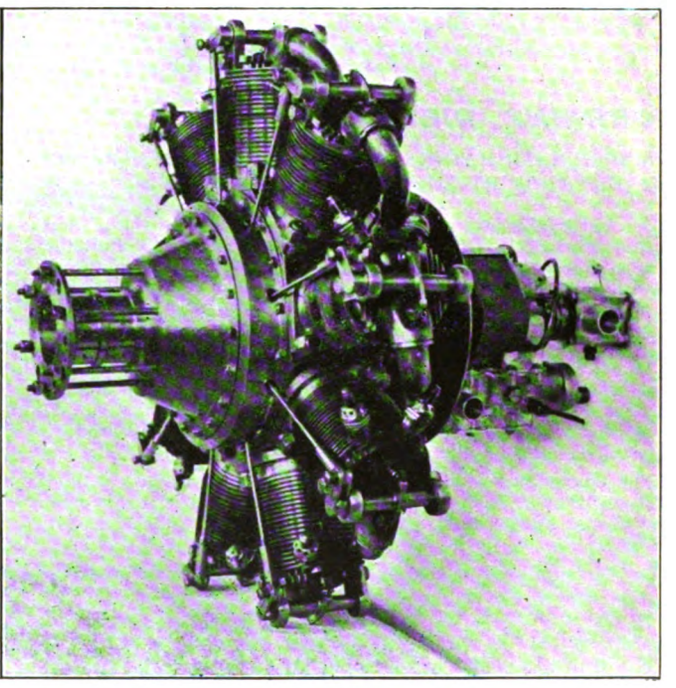
No. of cylinders	9.
Bore	115 m/m.
Stroke	170 m/m.
Normal h.p.	170 at 1,360 r.p.m.
Weight	166 kg.

OLDER LE RHÔNE TYPES.

80 h.p. 7 cylinders, 105 × 140 m/m (1200 r.p.m.), 199 lbs.
110 h.p. 9 cylinders, 112 × 175 m/m (1200 r.p.m.), 308 lbs.



Left, the 180 h.p. Le Rhône.



Right, the little 60 h.p. Le Rhône.

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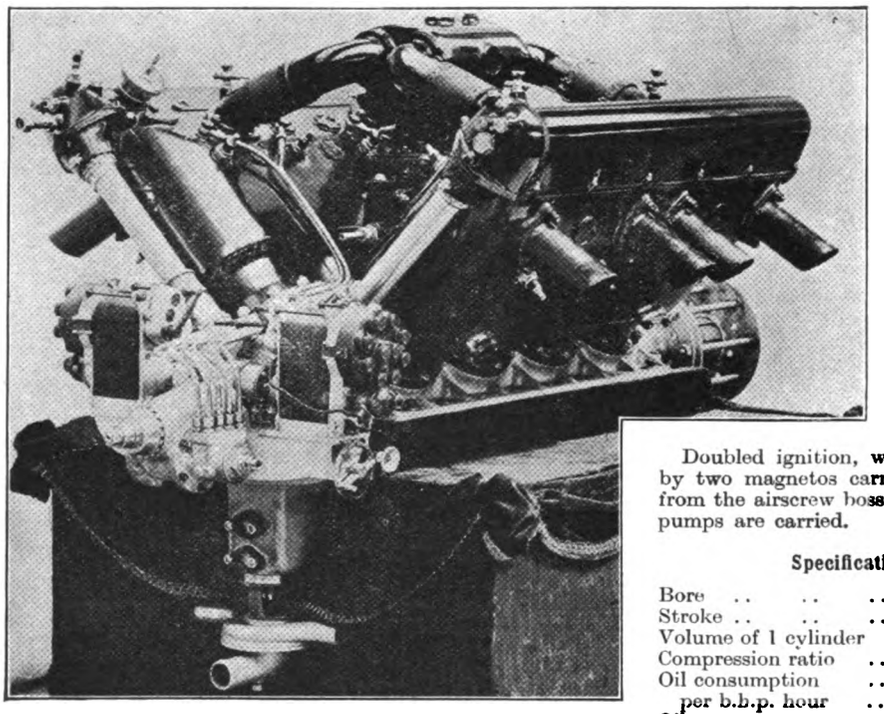
HISPANO-SUIZA.



The 300 h.p. Hispano-Suiza engine.

LA SOCIÉTÉ HISPANO-SUIZA., Rue du Capitaine Guynemeyer, Bois Colombes, Seine et Oise.

The standard modern type is the 300 h.p. direct drive.

This engine follows in general design the earlier well-known 150 h.p. and 200 h.p. models. It is an 8-cylinder Vee type engine, with the cylinders disposed in two rows at 90 degrees. These cylinders are cast in blocks of four, of aluminium, with screwed-in steel liners and combustion heads. Overhead valves, two per cylinder, are fitted, and the tappet head of the valve is operated on directly by the cams of the overhead camshaft. A Duplex carburetter, carried centrally within the Vee, supplies gas to the two cylinder blocks—the exhaust appearing from the outer sides.

Doubled ignition, with two plugs per cylinder, is provided by two magnetos carried on cross brackets at the end away from the airscrew boss, and at this same end the oil and water pumps are carried.

Specification of the 300 H.P. model.

Bore	140 m/m.
Stroke	150 m/m.
Volume of 1 cylinder	2,309 cub. cm.
Compression ratio	5.3 to 1.
Oil consumption	9 lbs. per hour.
per b.h.p. hour	0.026 pt.
Oil pressure	80 lbs. per sq. in.
Petrol consumption	197 pts. per hour.
per b.h.p. hour	0.64 pt.
Piston speed	1,820 ft. per min.
Mean effective pressure	117.0 at 1,850 r.p.m.

Two new Hispano-Suizas, both of the 12-cylinder type, were successful in passing the French type tests at the end of 1923 and the beginning of 1924. One of these engines is of the three-row, four-cylinders per row type of 450 h.p. and the other is a 12-cylinder V.

Of these, data concerning the 450 h.p. broad-arrow type alone is available. The engine weighs 376 kgs. (830 lbs.), gives 450 h.p. at 1,800 r.p.m. and consumes .224 kgs. (.5 lbs.) of fuel per h.p. hour. It is understood that the cylinder construction and the details generally follow standard Hispano-Suiza practice.

LORRAINE DIETRICH.

SOCIÉTÉ LORRAINE DES ANCIENS ETABLISSEMENTS DE DIETRICH, ET CIE., Argenteuil Seine et Oise.

An old-established engineering firm distinguished for their automobile work. During the War the firm took up the building of aero engines, and their products gained an excellent reputation for reliability in the French service.

They have built since the War an experimental engine of very large size which is illustrated.

This is a 1,000 h.p. engine with 24 cylinders, 126 by 200 m/m., each, arranged in the "broad arrow" manner. That is to say, there is a 16-cylinder "V" type engine with 8 cylinders a side set at about 120 degrees, with another 8-cylinder engine standing vertically in the middle of the "V."

The connecting rods of the vertical engine are the master rods and that those of the "V" engine are coupled one on each side of the master rods. The connecting rods themselves are tubular.

Gas is supplied to this engine by two double carburetters on one side of the engine and two single carburetters on the other side, in fact, 6 carburetters, each feeding a block of 4 cylinders.

The firm also build a 400 h.p. "V" type engine with 12 cylinders and a 370 h.p. "V" type engine with 12 cylinders and a Broad Arrow type 12-cylinder, 450 h.p. engine.

THE LORRAINE DIETRICH 400 H.P.

This is a 12-cylinder 60° Vee with steel cylinders and overhead valve gear, extremely like the Renault engines of similar type. It is in extensive use in French military aircraft.

Specification.

Bore	120 m/m.
Stroke	170 m/m.
Compression ratio	5.25.
Rated h.p.	400.
Normal r.p.m.	1,700.
Weight dry	400 kgs. (880 lbs.).
Fuel consumption	.24 kgs. (.52 lbs.) per h.p. hour.

THE LORRAINE DIETRICH 450 H.P. ("BROAD ARROW" TYPE.)

Bore	120 m/m.
Stroke	170 m/m.
Compression ratio	5.3.
Rated h.p.	450.
Normal r.p.m.	1,850.
Weight dry	380 kgs.
Fuel consumption	.235 kgs. (.51 lbs.) per h.p. hour.

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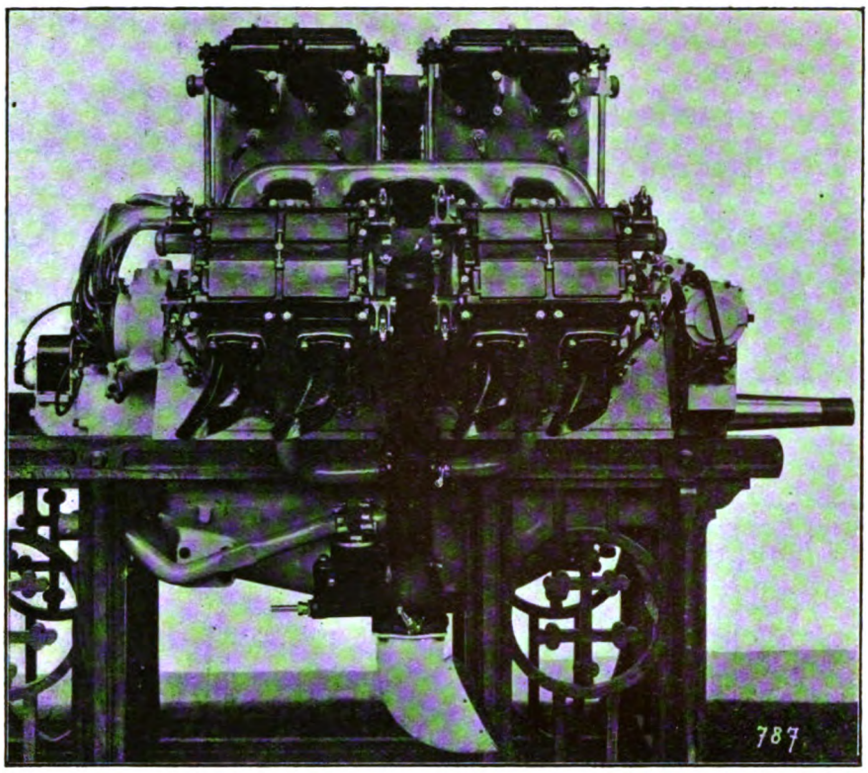
LORRAINE DIETRICH—*continued.*



The 12-cylinder "Broad Arrow" type Lorraine Dietrich engine of 450 h.p.

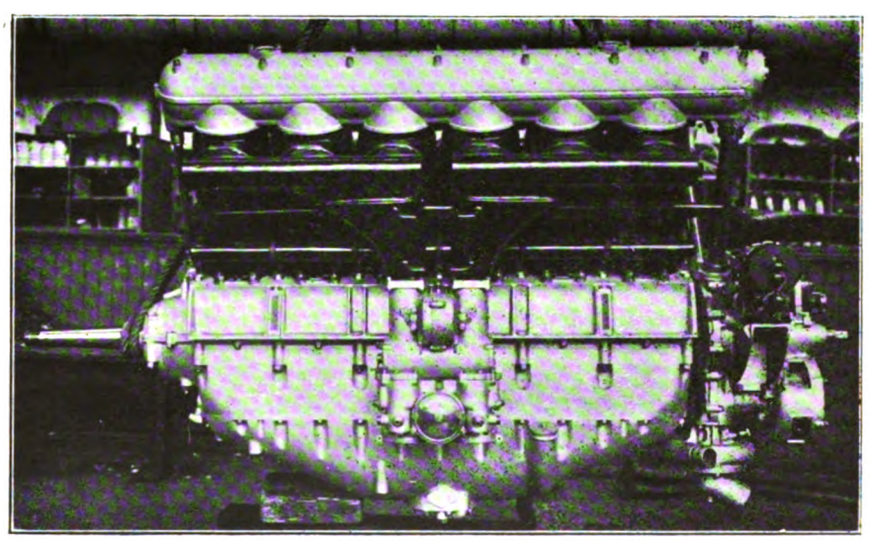
PANHARD.

SOCIÉTE ANONYME DES ANCIENS ETABLISSEMENTS PANHARD ET LEVASSOR, Avenue d'Ivry 19, Paris.

The most recent product of this firm in the aero-engine line is an engine of the super-compressed and over-dimensioned type, designed to preserve a constant output up to some appreciable altitude.

The engine is illustrated here. It is of the 12-cylinder Vee type, with an angle of 60 degs. between the Vees. The cylinders are of steel, separate, with welded-on strut steel jackets, with four overhead valves per cylinder. The overhead valve gear is entirely enclosed within a casing. In general the engine follows conventional design.

The bore is 165 m/m. and the stroke 170 m/m. Two magnetos and double ignition are fitted, and to provide for lubrication at any angle of inclination a somewhat complex lubrication system, involving four distinct oil pumps, is fitted.



The 500 h.p. Super-compressed Panhard engine.

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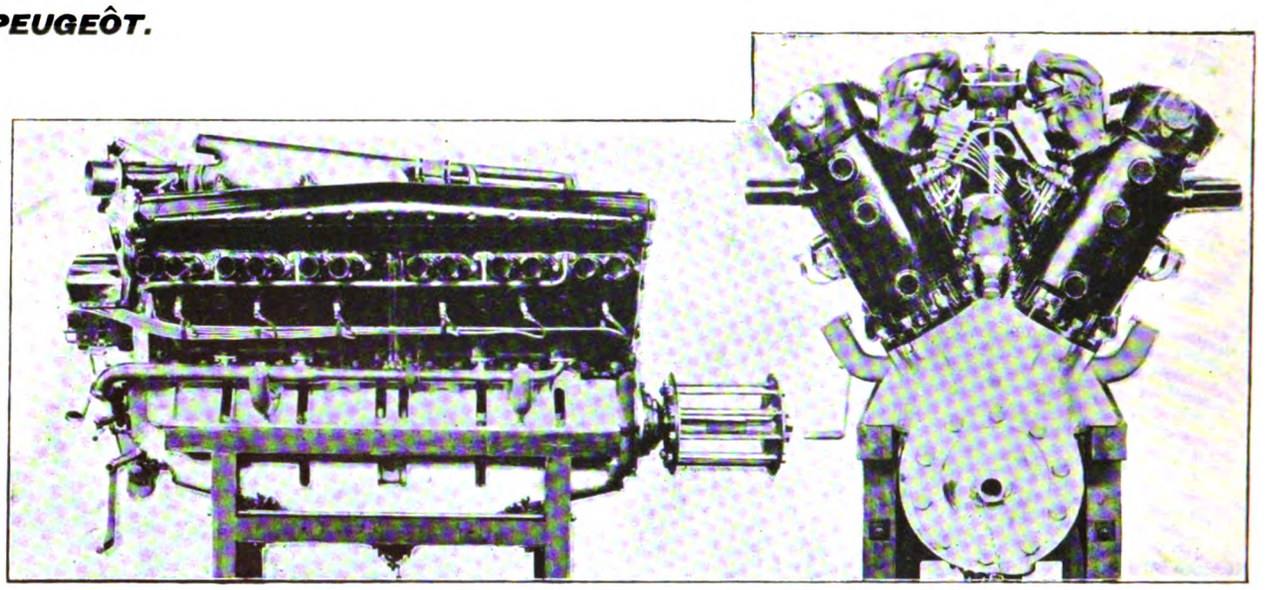
PEUGEÔT.



The 600 h.p. Peugeôt Engine, Type 12L.

SOCIÉTÉ ANONYME DES AUTOMOBILES, ET CYCLES PEUGEÔT, Rue Danton 80, Levallois-Perret Seine.

The firm build two engines, the 600 h.p. type 12L and the 600 h.p. 16L Marine.

TYPE 12L.

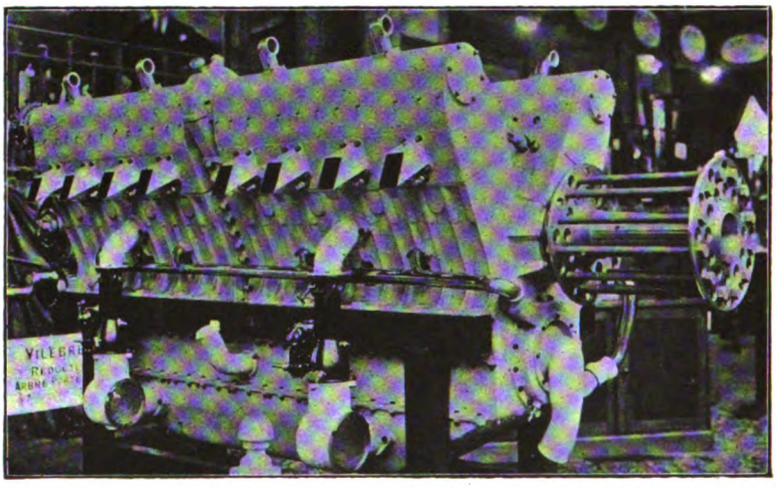
This is a 12-cylinder "V" with 65° between cylinders, of 160 m/m. bore and 175 m/m. stroke. It weighs 650 kgs. (1,430 lbs.) and develops 600 h.p. at 1,600 r.p.m.

TYPE 16L.

This is a 16-cylinder 50° "V" with a built-in reduction gear driven from the centre of the crankshaft. It is designed specially for heavy duty work on seaplanes.

Bore, 130 m/m.; stroke, 180 m/m.; 700 b.h.p. at 2,100 r.p.m. (1,300 r.p.m. airscrew).

These engines are built for the Peugeôt firm by the S. E. C. M. firm (see Aeroplane Section).



The 16-cylinder 600 h.p. Peugeôt Engine, Type 16L.

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RENAULT.

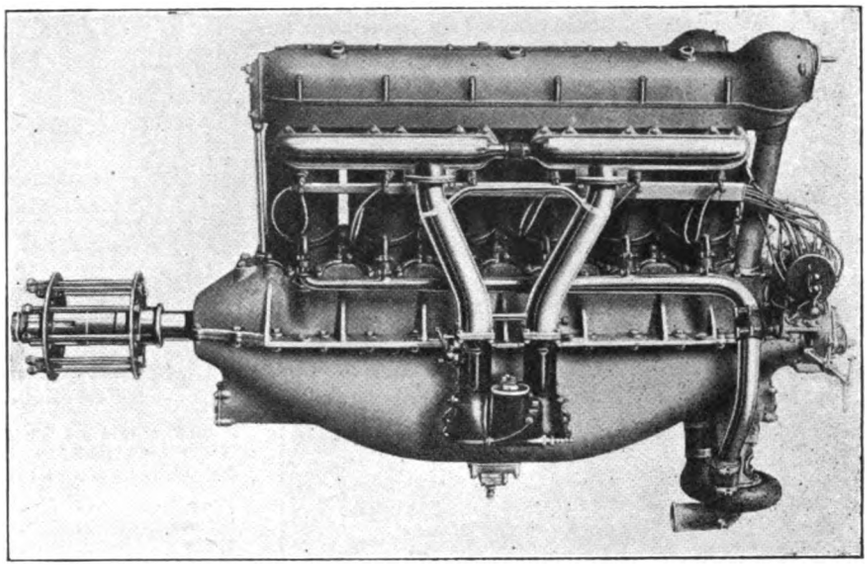
France :—LOUIS RENAULT, 15, Rue Gustav-Sandoz, Billancourt (Seine).

The main dimensions of the present standard Renault models are set out in the appended table :—

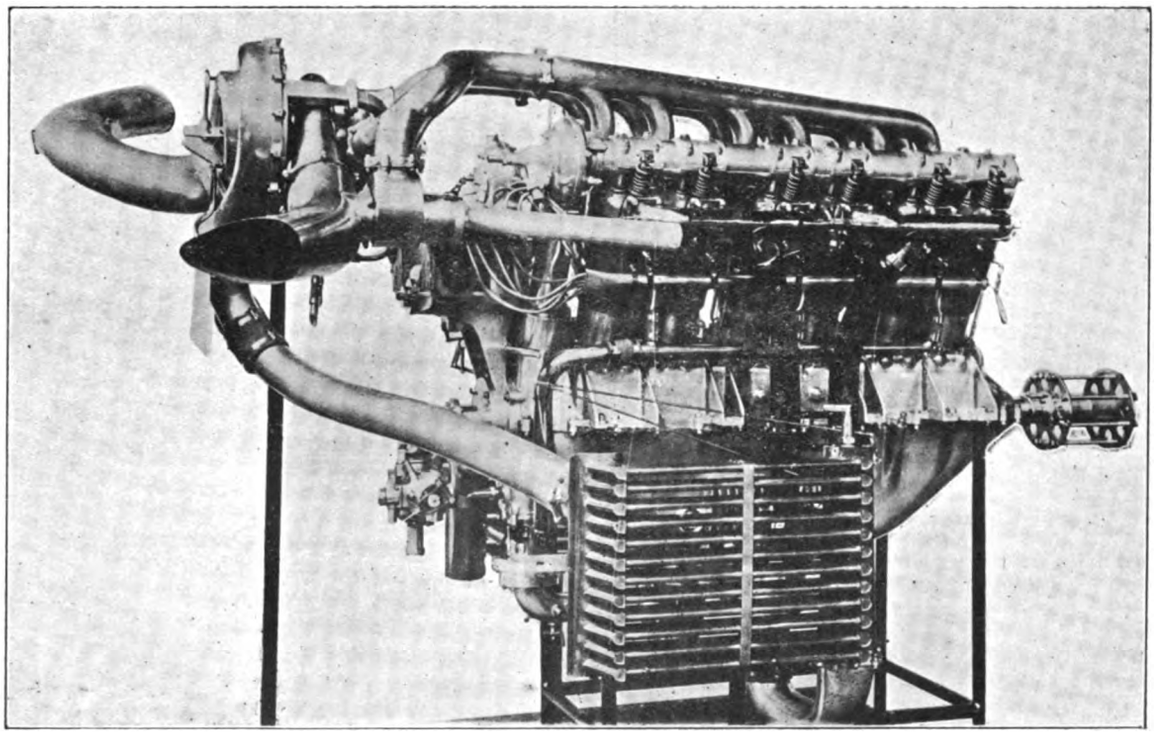
	300 H.P.	450 H.P.	550 H.P.
Arrangement of cylinders	12 in 50° Vee	12 in 60° Vee	12 in 60° Vee
Bore and stroke	125 m/m. × 150 m/m.	134 m/m. × 180 m/m.	160 m/m. × 180 m/m.
Total cylinder capacity ..	22.08 litres	30.45 litres	43.4 litres
Compression ratio ..	5/1	5/1	5.3/1
H.P.	320 at 1,600 r.p.m.	455 at 1,600 r.p.m.	575 at 1,600 r.p.m.
Consumption per h.p. hour .. Oil	0.025 kg.	0.025 kg.	0.025 kg.
Consumption per h.p. hour .. Petrol	0.260 kg.	0.260 kg.	0.26 kg.
Weight	380 kgs.	430 kgs.	650 kgs.

The 450 h.p. engine, fitted with a reduction gear, is made and known as the 400 h.p. Marine type. A similar engine, with an epicyclic reduction gear, is also manufactured.

The 300 h.p. engine is fitted with a Rateau supercharger as standard equipment for high altitude machines in the French Air Service.



The 450 h.p. Renault engine.



The 300 h.p. Renault, fitted with Rateau turbine supercharger, and air-cooling radiators.

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SALMSON.

SOCIÉTÉ DES MOTEURS SALMSON, 9, Avenue des Moulineaux, Billancourt.

(Salmson engines are built under the Canton-Unné Patents, and are in consequence frequently called Cantons, or Unnés.)

THE SALMSON TYPE A.B.9.

Perhaps the most interesting of all the Salmson engines is the type 9 R.A. This is, so far as one recollects, the first Salmson air-cooled engine.

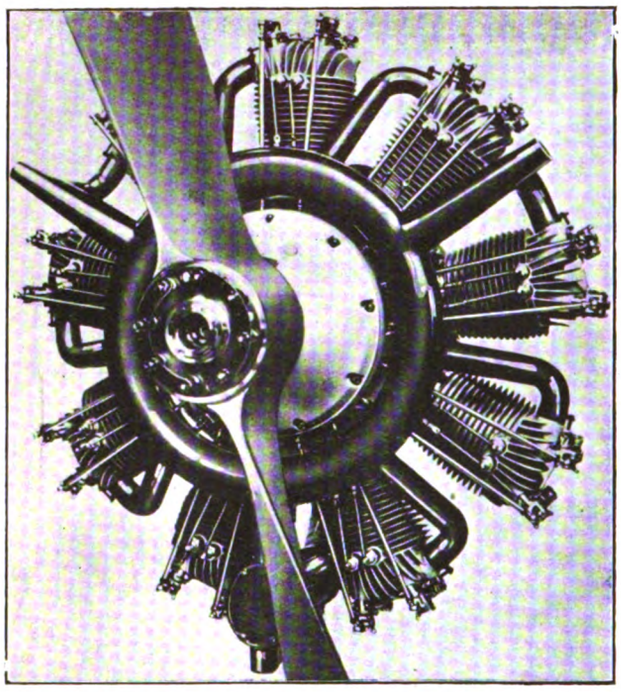
It has 9 cylinders, 125 by 170 mm., and apparently the cylinders are aluminium with steel or cast-iron liners. The weight is given as 230 kg. It is stated to give 245 h.p. at full power, its weight thus being 0.94 kg. per h.p. Its cruising power is given as 230 h.p. when its weight becomes 1.045 kg. per h.p., which is quite sufficiently light for commercial work.

THE SALMSON A.C.9.

The type 9R.A. has been followed by another engine of the same type, but of reduced dimensions, which is intended for school work. The engine is illustrated here.

Specification of the A.C.9.

No. of cylinders	9.
Bore	100 m/m.



The Salmson A.C.9 engine of 100 h.p.

Stroke	130 m/m.
Compression ratio	5/1.
Normal output	100 h.p. at 1,550 r.p.m.
Maximum output	120 h.p. at 1,600 r.p.m
Weight	140 kgs.
Fuel consumption	250 grammes per h.p./hr.

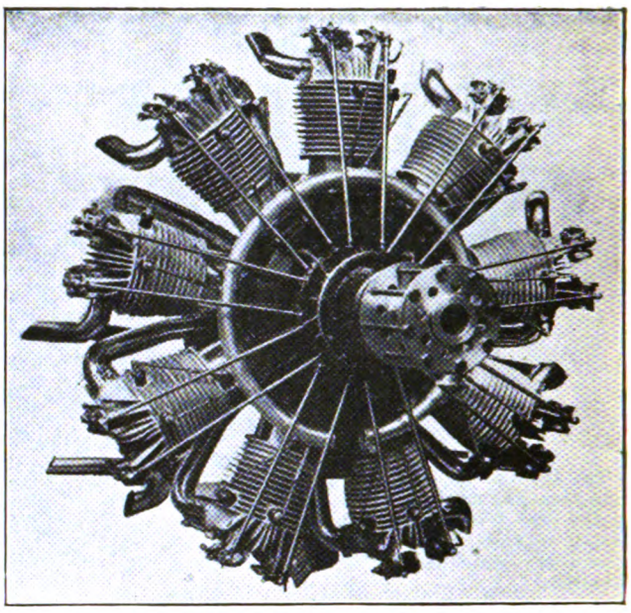
THE TYPE A.Z.9.

This is a water-cooled engine with 9 cylinders, 140 by 170 mm., giving 300 h.p. at 1,500 r.p.m. for 300 kg. weight. In this engine there are four valves per cylinder, and an entirely new type of valve gear is fitted which allows each cylinder to be dismounted for overhauling without having to disconnect fittings pertaining to other cylinders as has been necessary hitherto.

TYPE Z.18.

The Z.18 has 18 cylinders, 125 by 170 mm., giving 500 h.p. at 1,550 r.p.m. for 435 kg., which means 0.870 kg. per h.p.

An interesting point about the 1920 type of Salmsons is that they are fitted with a new type of valve spring. The old Salmson crab-type cradle spring is replaced by a much more elaborately curled affair, which is said to give far better results.

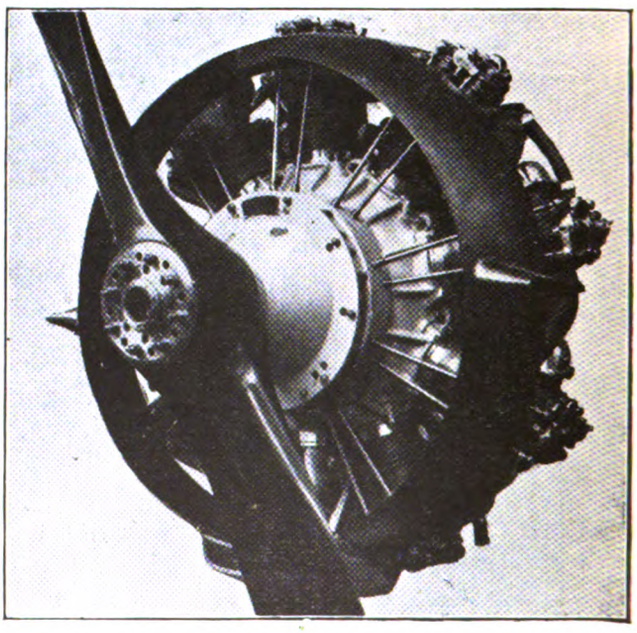


The Salmson type 9 R.A. of 245 h.p.

THE SALMSON LIGHT AEROPLANE ENGINE.

This is a small 3-cylinder radial air-cooled engine, known as the type A.D.3. It has performed satisfactorily in certain French light aeroplanes.

Bore	70 m/m.
Stroke	86 m/m.
Weight	34 kgs. (75 lbs.).
Nominal power	12 b.h.p.
Normal r.p.m.	1,800.



The A.Z.9 260 h.p. Salmson engine.

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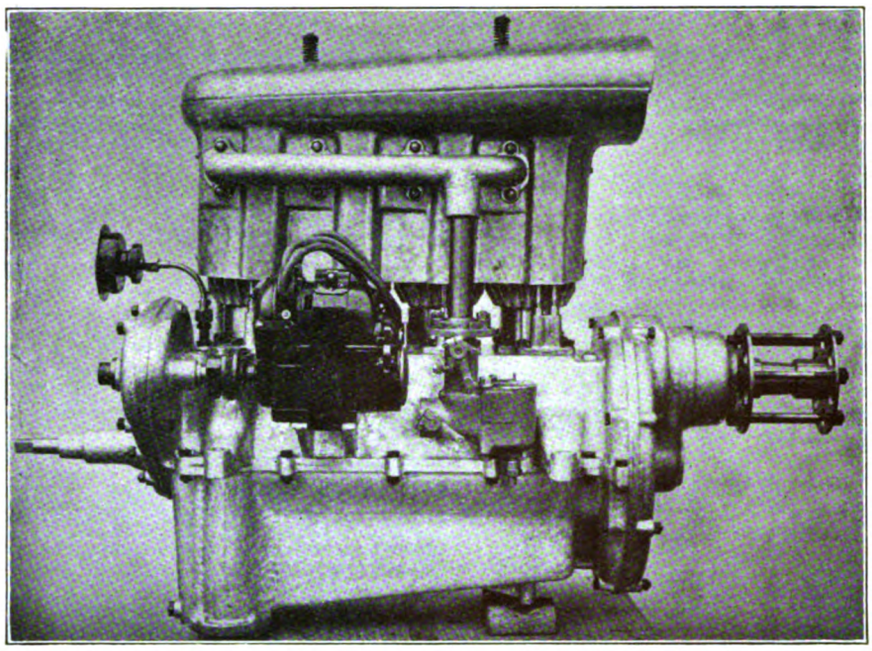
SERGANT.



The Sergant 760 c.c. Engine.

A. SERGANT, 9, Rue de Grande-Ceinture, Argenteuil.

Built in 1923 the little 4-cylinder engine illustrated for light aeroplanes. It is of the normal vertical type with overhead camshaft, but it is air-cooled by air from the slipstream collected by a scoop arranged over the cylinders, which passes down jackets, past the vertically finned cylinders.

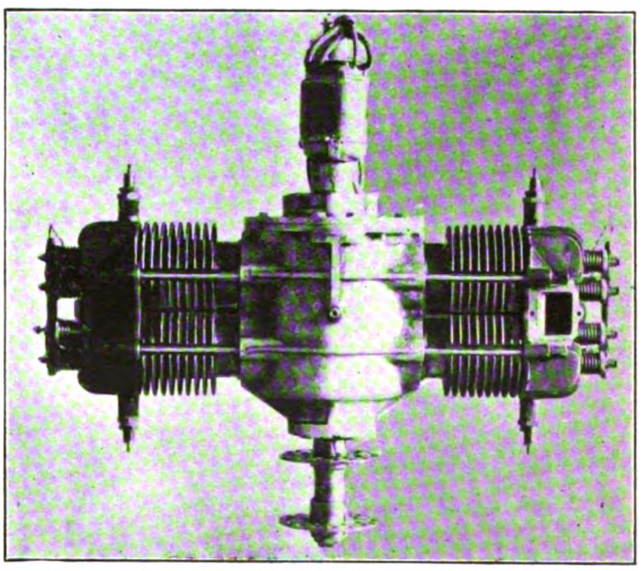
A reduction gear is built on to the engine, which is sweet running and seems to be reliable.

Cylinder capacity	..	..	..	760 c.c.
Output	..	..	..	16 b.h.p. at 3,200 r.p.m.
Weight	..	..	..	45 kgs. (99 lbs.).

VASLIN.

G. BELLAIS, 12, Avenue Gambetta Choisey le Roi, Seine.

The Vaslin engine, built for light aeroplane work, is of the 4-cylinder, double-opposed air-cooled type, with a cylinder capacity of 1,094 c.c. It develops 15 b.h.p. at 1,800 r.p.m.



The Vaslin Light Aeroplane Engine.

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GERMAN ENGINES.

ADLER.

ADLER AUTOMOBIL-WERKE, Frankfurt a/M.
This firm has built no aero-engines since the 8-cylinder 225 h.p. type described in previous issues.

BASSE AND SELVE.

BASSE & SELVE, Altena, Westphalen.
No aero-engines have been produced since the War.

ARGUS.

ARGUS MOTOREN FABRIK, Berlin-Reinickendorf.
A motor car building concern established in 1900. Built the first German water-cooled aero-engine. About 1912, the "Argus" was the most extensively used German engine, and engines of their make were used in some quantity during the War. No aero-engines have been built since the conclusion of peace, the latest product being the 8-cylinder "V" described in previous volumes.

BENZ.

BENZ & CIE, Mannheim.
This—one of the earliest, if not the earliest, producers of practical petrol engines—was responsible during the War for many notable aero-engines. Under the restrictions imposed by the Peace Treaty, it has not been considered worth while to continue aero-engine work. The most recent Benz engines have been fully described in earlier volumes.

B.M.W.

BAYERISCHE MOTOREN WERKE A.G., Munich.

The original B.M.W. ceased to operate, and the Bayerische Flugzeug Werke, formerly so-called, acquired the rights in the B.M.W. engines, changed its name to Bayerische Motoren-Werke, took over the original B.M.W. works, at Munchen, and now manufacture the B.M.W. aero, automobile and motor-cycle engines.

At the present moment, they have not restarted manufacture of the aero-engines.

The B.M.W. Type IIIA, modified by the reduction of the compression to come within the regulations of the International Commission of Control, is constructed under licence by the Junkers Werke. It is of 200 h.p. and is known as the B.M.W.III.

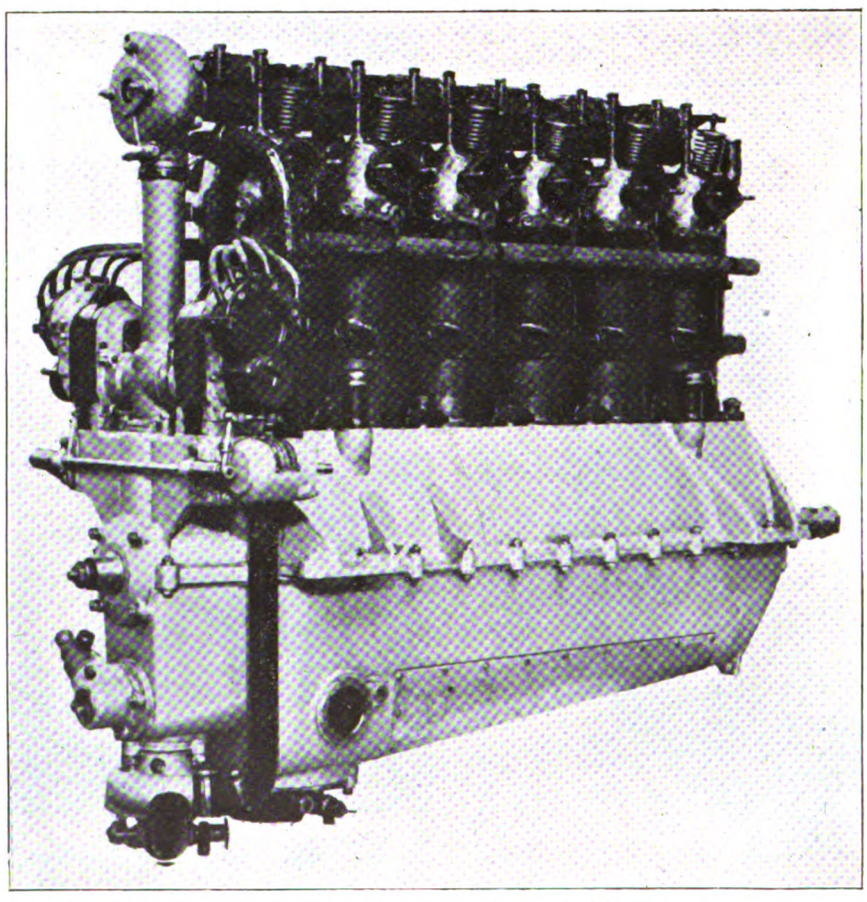
The B.M.W. engine was the most successful of the German super-compressed engines, and samples are now in use in America, Switzerland, Scandinavia, Italy, Holland, Russia and even in France.

These engines are marked by the following points :—

1. Simplicity of construction, easy manipulation, absolute reliability and great strength, insensibility to external influences even when being handled by inexperienced pilots.

2. Remarkably low fuel consumption even when using low-grade fuel with almost fully throttled motor flying at great heights. Consequently, great range of action at high speed and low cost of running, which is an important factor for aerial post service and traffic.

The cylinders are of steel with jackets of steel-sheet welded to the cylinders.



The B.M.W.II engine of 120 h.p. The smallest of B.M.W. engines.

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B.M.W.—*continued.*

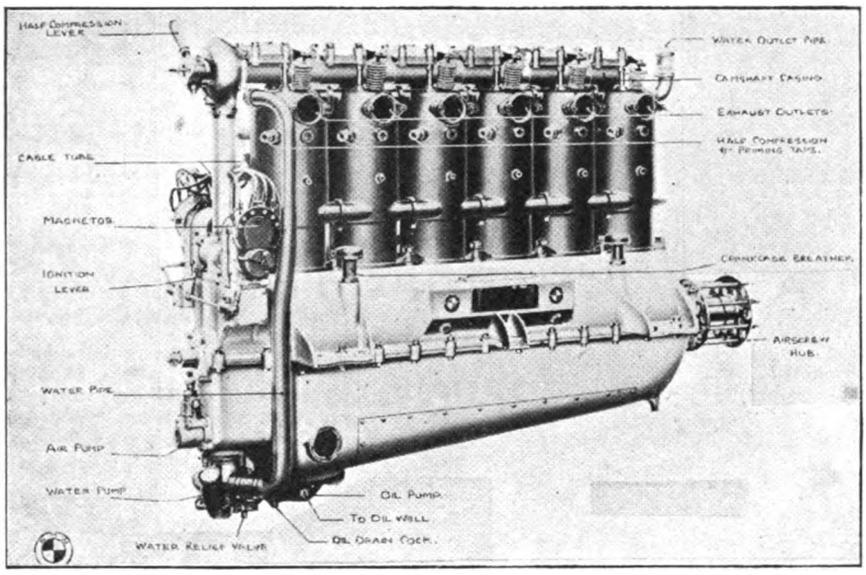
In general construction, the engine follows standard German practice, having the characteristic overhead valve gear.

The most notable feature of the B.M.W. engine is its amazingly low fuel consumption, which is well below .5 lbs. per h.p. hour. It is alleged that this economy is largely due to the special B.M.W. carburettor, but it is obvious that no such result could be achieved by carburation alone, apart from excellent gas distribution and cylinder head and valve passage design.

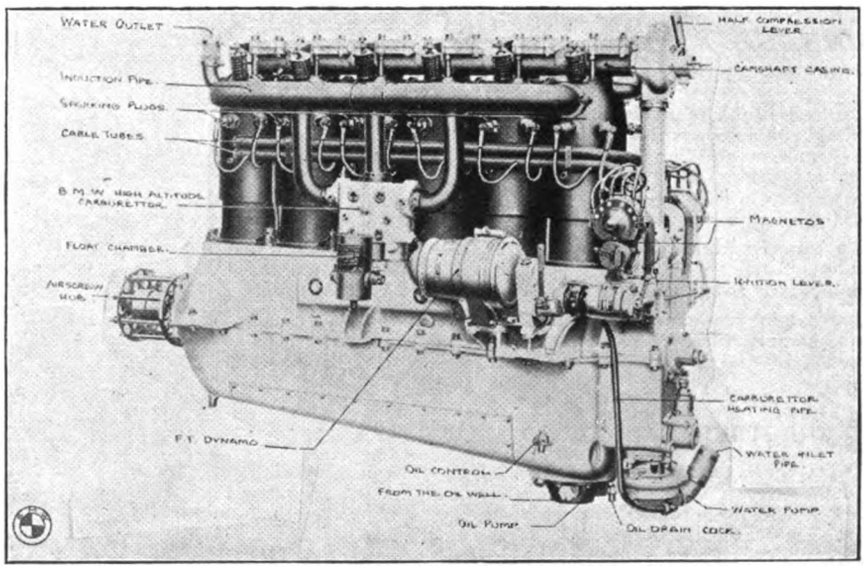
PARTICULARS OF THE B.M.W. ENGINES.

	BMW II	BMW III	BMW IV
Type of motor			
Horse-power	120	200	240
Number of cylinders	6	6	6
Bore (inches)	4.7	5.9	6.3
Stroke (inches)	6.3	7.1	7.5
Normal r.p.m.	1,400	1,400	1,400
Fuel consumption per h.p. (oz.) ..	8.1	7	6.7
Lubricating oil per h.p. (oz.)	0.42	0.35	0.28
Service weight of engine, excluding water, oil and propeller hub ..	465	630	650
Weight of cooling water (lb.) ..	19	27.5	22
Weight of oil in crank casing (lb.) ..	7.7	8.8	8.8
Weight of propeller hub (lb.) ..	11.4	14.4	14.4

[NOTE.—It is to be recorded that the World's Duration Record of 26 hours, 19 minutes, made by two American Aviators on a Junkers monoplane, was accomplished with a B.M.W.IIIA 185 h.p. engine of the original super-compressed type.—Ed.]



Exhaust Side of the 185 h.p. B.M.W. Engine.



Carburettor Side of the 185 h.p. B.M.W. Engine.

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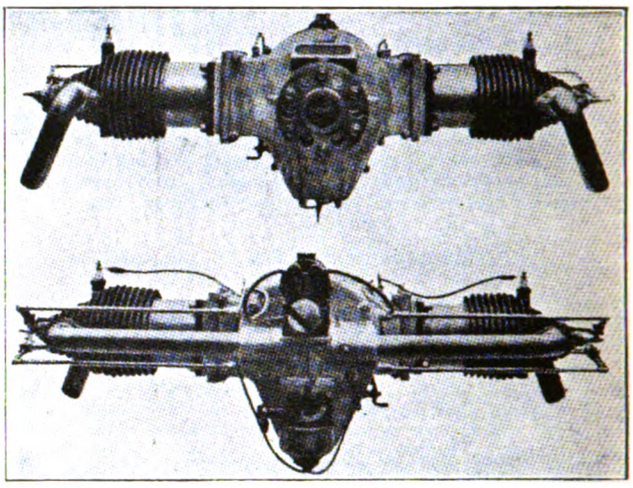
HAACKE.

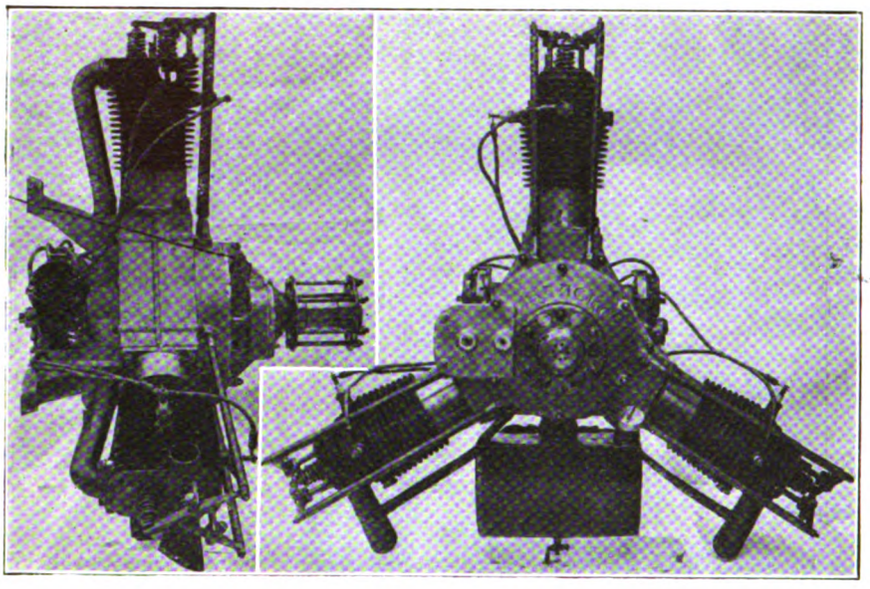
HERMANN HAACKE, Berlin Johannisthal.

THE 30 H.P. HAACKE ENGINE.

This engine, fitted to the Rieseler monoplane and other sports machines, is of the 2-cylinder opposed air-cooled type. Cylinders are of aluminium with steel liners. The crankcase is an aluminium casting, whose lower half acts as an oil reservoir carrying sufficient oil for six to eight hours' run. Lubrication is effected by two plunger pumps. The bore is 120 mm., stroke 140 mm., output 30 h.p. at 1,500 r.p.m. The consumption is said to be 8 litres of spirit and 0.300 kgs. of oil per hour, and the weight is about 65 kgs.



The 2-cylinder 30 h.p. Haacke engine.



THE 45 H.P. HAACKE ENGINE.

This is a 3-cylinder radial which was produced in 1923. It has aluminium cylinders with steel liners, with a bore and stroke of 112 m/m. × 120 m/m. and develops 48 h.p. at 1,400 r.p.m. The weight is 60 kgs.

JUNKERS.

JUNKERS MOTORENBAU G.m.b.H., Dessau.

Professor Junkers' name is already well known in the aircraft world in connection with the all-metal aircraft bearing his name. His firm has also largely specialised in the manufacture of large gas engines of the Ochelhauser two-stroke type, with twin pistons in each cylinder moving in opposite directions, the working space being between the two pistons.

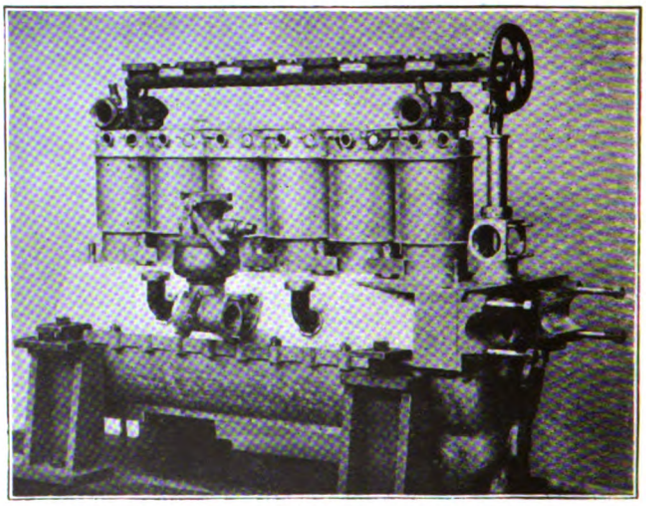
An experimental Junkers aero-engine follows this practice, and was fitted with a crankshaft at each end of the row of cylinders, the two shafts being coupled through a train of gears.

This engine was described in earlier volumes of this annual. Unfortunately further developments of the type have been retarded by the present state of affairs under the Treaty of Peace.

THE JUNKERS AIR-COOLED ENGINE TYPE L.1.

This is a new engine produced during 1923 which is now being used in certain of the smaller Junkers machines. In arrangement the engine is of the standard German 6-cylinder vertical type, with overhead camshaft.

The special feature is the air-cooling system carried out by means of a centrifugal fan on the airscrew end of the crankshaft which delivers air into a cylinder casing of light sheet metal—somewhat on the lines of the old air-cooled Renault aero-engines, and of certain recent American car engines. Apparently it has not been found necessary to fit fins to the cylinder barrels themselves, and even more surprising is the fact that no very special precautions seem to have been taken to cool the cylinder heads. The cooling air outlets appear to be alongside the exhaust ports, which must help appreciably in the cooling of the head, but it seems probable that the engine is relatively large for its output and does not call for very great care in cooling.



The L.1 engine partly erected, from the intake side.

Apparently the L.1 engine is intended rather as a cheap and serviceable power plant for small and relatively low-performance aircraft of fairly high efficiency, and it has been considered expedient to sacrifice engine weight and efficiency to simplicity of construction.

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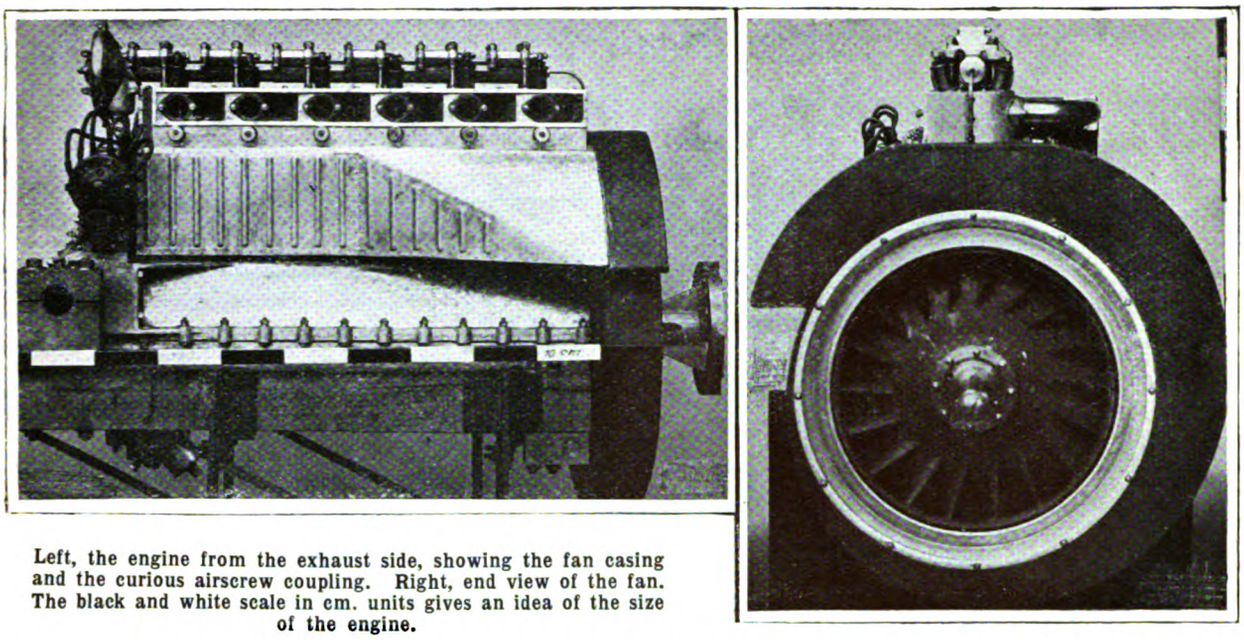
JUNKERS—*continued.*



Left, the engine from the exhaust side, showing the fan casing and the curious airscrew coupling. Right, end view of the fan. The black and white scale in cm. units gives an idea of the size of the engine.

As can be seen in the photographs, detachable cylinder heads which should simplify overhaul, are fitted. An interesting feature is the provision at the gear end of fittings to take a tubular cross-beam from which to support the engine. The crankcase is sufficiently stiff to allow the engine to be supported from this bearer and from the front of the crankcase without fore and aft beams.

The firm build B.M.W.III engines under licence.

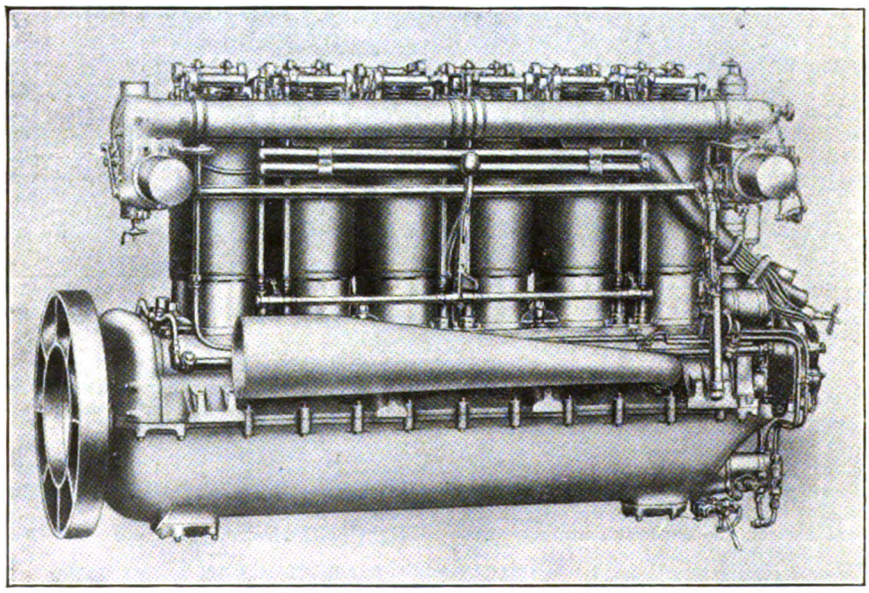
MAYBACH.

MAYBACH MOTORENBAU G.m.b.H., Friedrichshafen.

Dr. Ing. e. h. Karl Maybach, director of this firm, is the son of Wilhelm Maybach, formerly of the Daimler firm and an early collaborateur of Gottlieb Daimler. Maybach has been responsible mainly for the development of airship engines, though many engines of Maybach design were used in aeroplanes during the War.

The work of the firm in respect to engine development has been curtailed by the provisions of the Peace Treaty, but the firm have constructed for the airship built for the United States Government by the Zeppelin firm, a set of airship engines which embody a number of novel features.

Unlike all previous Maybachs, these engines are of the 12-cylinder "V" type, designed to develop 400 b.h.p. continuously at 1,400 r.p.m. Cylinders are of grey cast iron with welded steel jackets, fitted with one inlet and two exhaust valves. The valves are push rod operated from a camshaft between the cylinders. This camshaft is of the sliding type, providing for a reversal of the direction of running. Starting is by compressed air and starting, reversing throttle and ignition levers are interlocked in such a manner that incorrect operation of the starting and reversing controls cannot occur. The throttle must be closed before the reversing gear can be shifted. Unfortunately, no details of the dimensions, etc., are at present available, but it is understood that the engine is somewhat heavily constructed, as it is desired to secure the maximum reliability and the minimum fuel consumption.



A Maybach airship engine of the end of the war type, as used on the commercial airship "Bodensee" (300 h.p., 165 m/m. bore, 180 m/m. stroke.)

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MERCEDES.

DAIMLER MOTOREN GESELLSCHAFT, Stuttgart-Untertürkheim.

The Daimler-Mercedes engine was brought into limelight by Hirth in numerous flights, and was adopted from 1912 in 85-90 per cent. of German aeroplanes.

Daimler engines were employed in the first German airships, but the former chief engineer of the Company, Maybach, left to specialize in airship engines and the Maybach type became the standard airship engine.

During the War, the 160 h.p. and 260 h.p. Mercedes engines were very extensively used. All these engines were of the 6-cylinder vertical type, but late in the War the firm produced an 8-cylinder "V" type of 185 h.p., which, however, did not reach the fighting front.

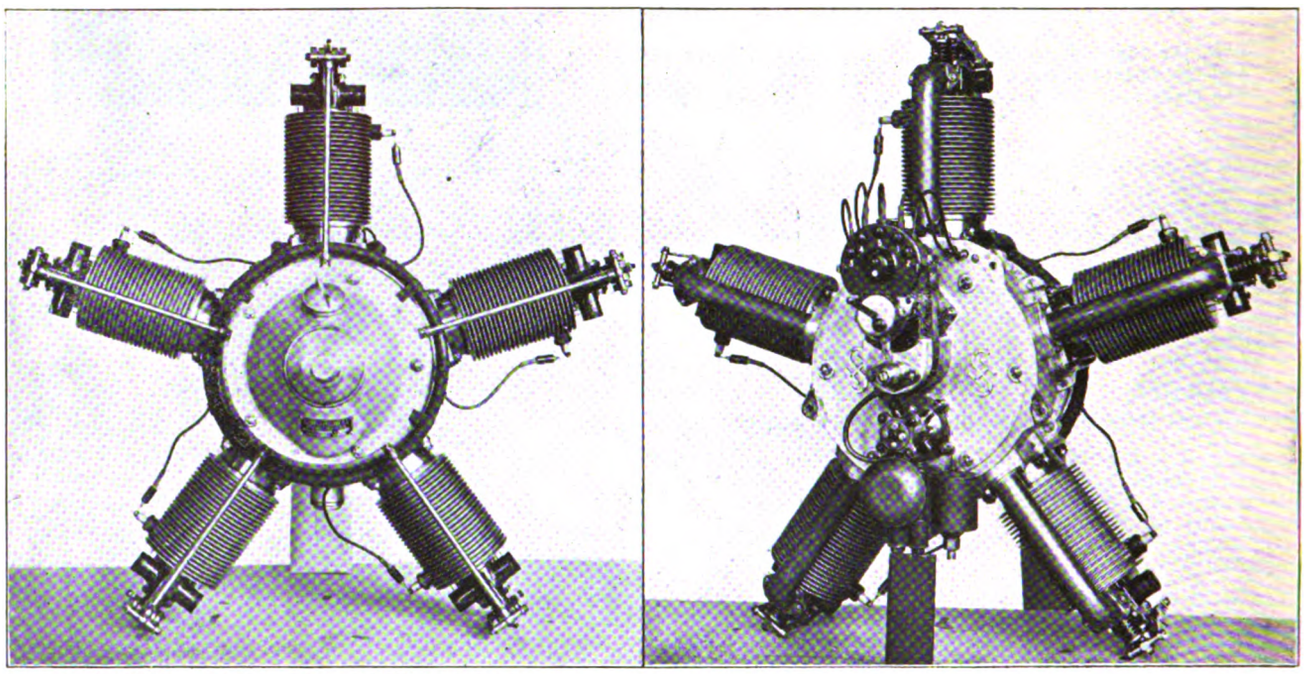
No new aero-engines have been produced since 1918.

RUMPLER.

RUMPLER WERKE A.G.i.L., Berlin, Johannisthal.

In the last issue of this volume the design for a 1,000 h.p. engine due to Dr. Rumpler was described. This design has never materialized.

SIEMENS.



The 55/60 h.p. Siemens Halske radial engine.

SIEMENS & HALSKE, Siemensstaat bei Berlin.

Are now constructing air-cooled radial engines of low power.

The cylinders are aluminium barrels fitted with thin steel liners.

Two overhead valves, both operated by one pull and push rod, are fitted to each cylinder. Double magnetos and plugs may be fitted if required.

Three models are available, of 5, 7 and 9 cylinders respectively.

THE SIEMENS HALSKE ENGINES.

Bore	100 m/m.
Stroke	120 m/m.
Normal h.p.	55 h.p., 75 h.p., 105 h.p.
Normal r.p.m.	1,500.
Consumption, fuel	260 grammes/h.p
Weight	102 kgs., 126 kgs., 140 kgs.

STATAX.

F. J. M. HANSEN, Köln.

This firm specializes in light low-powered engines for machines of the type evolved from gliders. They have designed a very interesting little engine known as the "Statax," which, however, has not yet given results in flight.

This is a 3-cylinder radial two-stroke, with the cylinder heads at the end nearest the crankshaft, the explosion impulse thus producing tension in the connecting rods, which are in duplicate, in front of and behind the cylinder, and outside of it.

The following data only are available :—

No. of cylinders	3.
Bore	60 m/m.
Stroke	70 m/m.
Capacity	594 c.c.
Normal h.p.	7.5.
Weight (with airscrew)	8 kgs.

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ITALIAN ENGINES.

ANSALDO.

ANSALDO SAN GIORGIO, Rue Cuneo 20, Turin.

A branch of the famous Italian engineering and shipbuilding concern, who have among other activities taken up the building of aircraft engines.

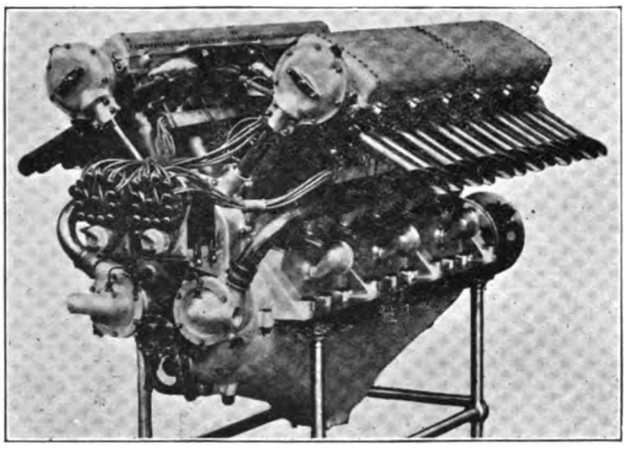
These are made in two types, a 6-cylinder vertical of 290/310 h.p. and a 12-cylinder Vee of 520/570 h.p.

Generally, the two engines are built on similar lines, each cylinder being a separate steel unit with welded on steel jackets and overhead valves. There are four valves per cylinder, and these are operated by an overhead camshaft. Connecting rods are of tubular section, and in the case of the Vee type engine articulated rods are used.

Specifications.

	4E-145	4E-284
Type	4E-145	4E-284
No. of cylinders	6 (vertical)	12 (Vee)
Bore	145 m/m.	140 m/m.
Stroke	180 m/m.	180 m/m.
Normal r.p.m.	1650.	1650.
Normal h.p.	290.	520.
Max. r.p.m.	1800.	1800.
Max. h.p.	310.	570.
Weight dry	290 kgs.	510 kgs.
Fuel per h.p. hour	.215 to .220 kg.	.215 to .220 kg.
Oil per h.p. hour	.01 to .015 kg.	.01 to .015 kg.

There is in addition a type 4E-15, which appears to be a modified 4E-145, giving 325 h.p. at 1,750 r.p.m.



Three-quarter view from gear end of the Ansaldo type 4E-284.

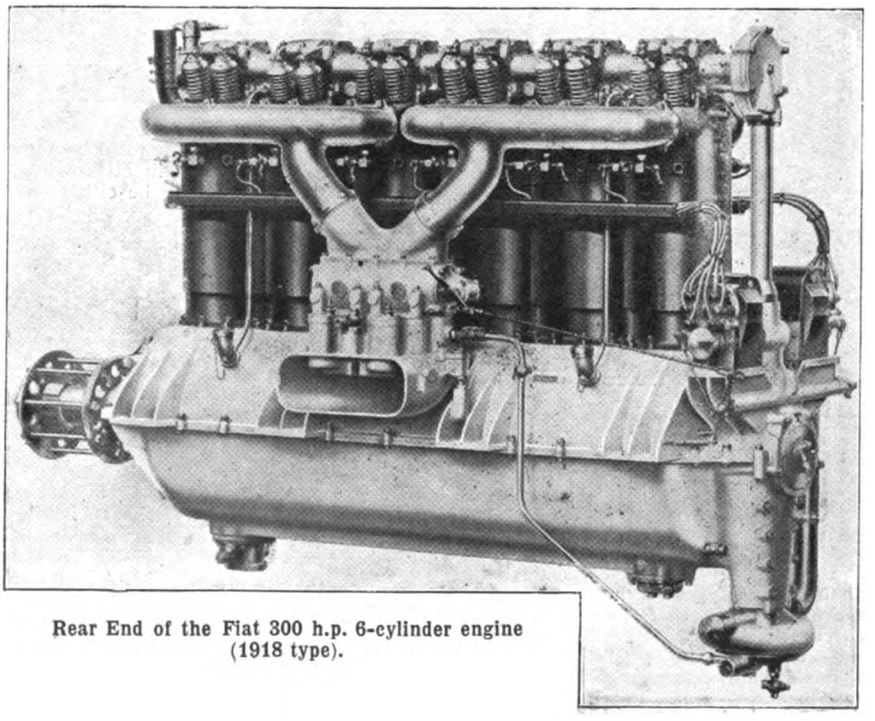
FIAT.

SOCIETA ANONYMA F.I.A.T., Turin.

The Fiat 300 h.p.
Bore: 160 m/m.
Stroke: 180 m/m.
No of cylinders: 6.
R.P.M.: 1,700.
H.P.: 300.

Specification of the F.I.A.T. Type A14.

Power	Maximum at 1,700 r.p.m.	750 h.p.
	Average, 1650 r.p.m.	685 h.p.
	Guaranteed, 1,650 r.p.m.	625 h.p.
Normal speed		1,650 r.p.m.
Maximum speed		1,700 r.p.m.
Average speed of piston		10.8 m./secs.
No. of cylinders		12.
Cylinder bore		170 m/m.
Stroke		210 m/m.
Ratio of compression		4.5.
Mean effective pressure		6.7 atmospheres.
Total weight, dry		730 kgs.
Total weight, including water		760 kgs.
Approximate total weight, with water and radiator		845 kgs.
Weight per h.p., dry		0.970 kg.
Weight per h.p. engine, with water and radiator		1.13 kgs.
Petrol consumption per h.p. hour	Gauranteed, 0.235 kg.	
	Average, 0.220 kg.	
Oil consumption per h.p. hour	Guaranteed, 0.030 kg.	
	Average, 0.022 kg.	



Rear End of the Fiat 300 h.p. 6-cylinder engine (1918 type).

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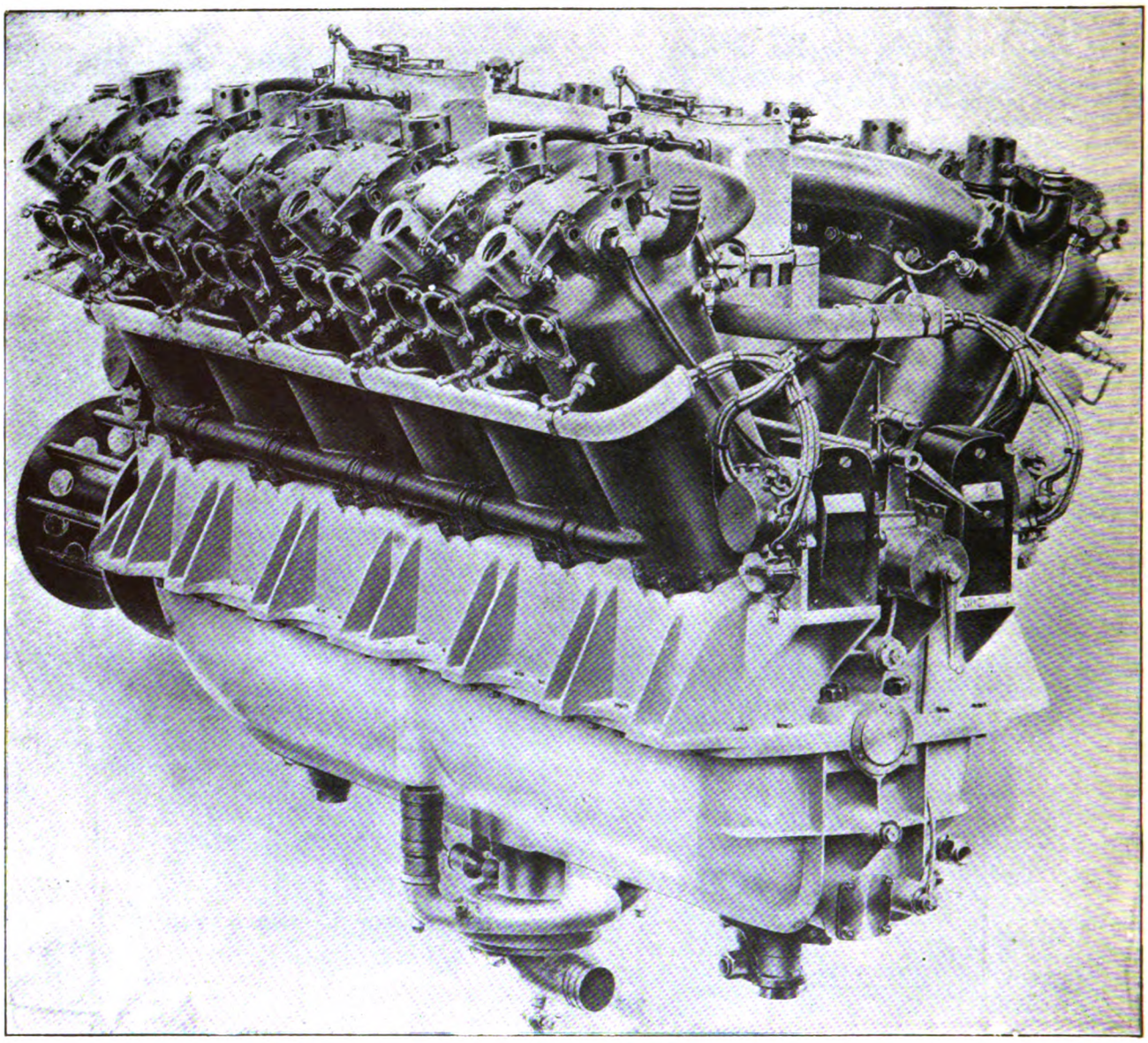
FIAT*—*continued.



Rear end of the 12 cylinder Fiat engine. 700 h.p.

Lubrication system	Forced feed.
Ignition system	4 magnetos, with 12 spark plugs.
No. of spark plugs for each cylinder	4.
No. of valves per cylinder	4.
No. of carburetters	4.

Remarks.—The weights are to be allowed 5% plus tolerance. The propeller is applied directly on the crankshaft, with left-handed rotation and may be either tractor or pusher.

ISOTTA-FRASCHINI.

LA FABRICA AUTOMOBILI ISOTTA FRASCHINI, Via Monte Rosa 79, Milan.

The Isotta Fraschini firm are famous as motor car, aero-motor and big marine motor builders. Their aeromotors were used first on the hydro-aeroplanes of the Italian Navy, and later on biplanes of *Voisin* type before Italy came into the war, and they have since been used successfully on *Caproni* triple engine biplanes. The newer Isotta-Fraschini engines, type V6 were adopted also in the Italian "chaser" aeroplanes. Moreover, the Isotta-Fraschini is the only Italian firm that has made a speciality in the manufacture of big marine motors from 300 to 800 h.p. which have been adopted in a large scale by the Italian Navy on the "chaser" boats against submarines.

So far as can be discoved the type V9 engine is the only one of this make which is still produced. It is said that the firm is now building Lorraine Dietrich engines under license.

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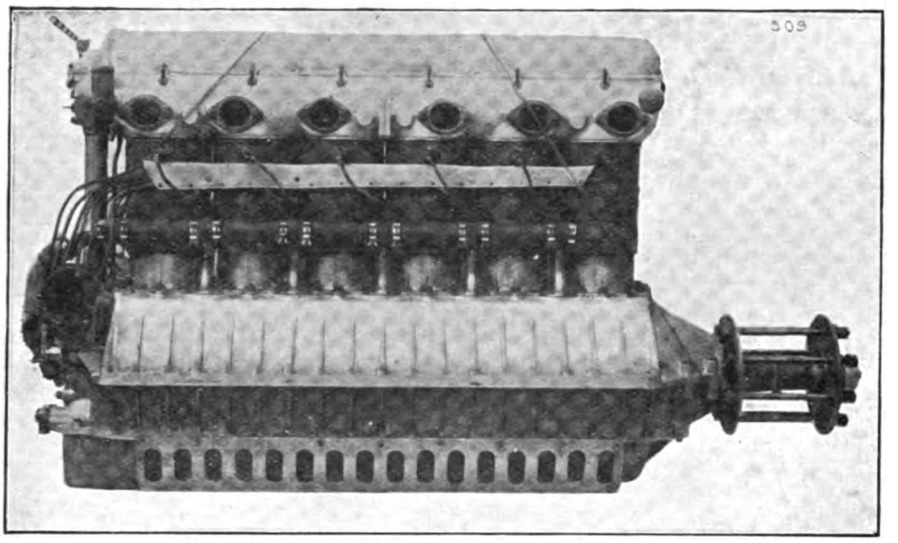
ISSOTTA-FRASCHINI— *continued.*

310 h.p. Model. Type V9.

Type.. ..	Water-cooled vertical.
No. of cylinders	6.
Bore of cylinders	150 m/m.
Stroke of pistons	180 m/m.
R.P.M. ..	1,800.
Cylinders ..	In pairs—steel water jackets.
Valves ..	Overhead camshafts and valves.
Carburetters ..	Twin.
Ignition ..	2 six-spark magnetos.
Lubrication ..	Forced feed.



The Issotta-Fraschini V9 Engine.

SWISS ENGINES.

WINTERTHUR.

SOCIÉTÉ SUISSE POUR LA CONSTRUCTION DES LOCOMOTIVES, Winterthur.

THE WINTERTHUR 200 H.P. ENGINE.

This engine is largely used by the Swiss Military Air Service, and in a Haefeli biplane recently reached a height of 7,250 metres, carrying a passenger.

The engine is of the 8-cylinder Vee type, with separate cylinders machined from steel forgings, fitted with welded on steel jackets. Both inlet and exhaust valves are surrounded by the jacket water.

The crankshaft runs in plain white metal lined bearings, with a ball-thrust race at the airscrew end.

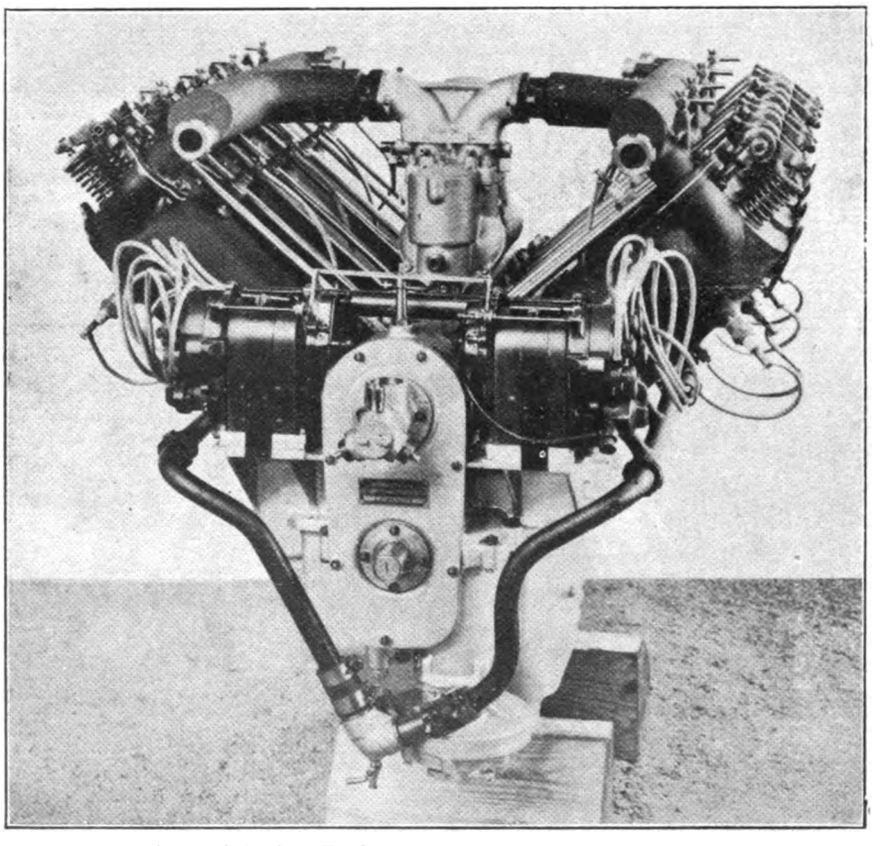
The crankcase is a split aluminium casting, forming a deep oil sump, wherein a drowned pressure pump operates and supplies oil to all crank- and cam-shaft bearings.

The camshaft is carried between the Vee and is driven from the crankshaft end by a train of three spur wheels.

Complete dual ignition, two plugs per cylinder energised by two 8-cylinder magnetos are fitted. A twin carburetter, fitted with an altitude adjustment, is mounted between the two cylinder rows.

The following are the main details :—

Bore	150 mm.
Stroke	125 mm.
Weight (dry)	228 kilos.
Normal h.p.	200 at 1,520 r.p.m.
Maximum h.p.	210 at 1,600 r.p.m.
Weight per h.p.	1.14 kilos.



The 200 h.p. Winterthur Engine.

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U. S. A. ENGINES.

AEROMARINE.

THE AEROMARINE PLANE & MOTOR COMPANY.
Offices and works : Keyport, New Jersey.

AEROMARINE MODEL U-873 ENGINE.

This engine is similar in its essential dispositio s to the Aeromarine U-8-D engine which passed last year the 300 hour endurance test prescribed by the Navy Department. Although the displacement of the U-873 is 873 cub. ins. as against 737 cub. ins. for the U-8-D, and the new model is rated 250 h.p., it is i evertheless 77 lbs. lighter than the U-8-D. A notable feature is the provision for detachable cylinder heads.

Specification of the Aeromarine U-873 Engine.

No. of cylinders.	8.
Angle	60 degs.
Bore	4⅝ ins (117 m/m.).
Stroke	6½ ins. (165 m/m.).
Piston displacement	873 cub. ins. (14,300 c.c.)
Rated h.p.	260.
R.P.M.	1,800.
Weight dry	499 lbs.

AEROMARINE MODEL T-6.

This engine is a straight line 6-cylinder with integral crankcase and water jacket, and inserted steel cylinder sleeves. The cylinder head contains the valve mechanism and is detachable as a unit. The propeller hub is interchangeable with that of the Model U-873 engine, as is also the accessory bracket which carries water, oil and fuel pumps, starter and magneto.

The T-6 is intended for training machines.

Specification of the Aeromarine Model T-6 Engine.

Bore and stroke	5¼ × 6½ ins. (136 × 165 m/m.).
Displacement	844 cub. ins.
Compression ratio	5.2 to 1.
Crankshaft diameter	3 ins.
Inlet valve diameter	2⅞ ins.
Rated h.p. at 1,650 r.p.m.	200.
Maximum h.p. at 1,800 r.p.m. ..	255.
Dry weight (includes propeller hub, but no fuel pump, starter, generator, gun control, or exhaust manifold)	590 lbs.

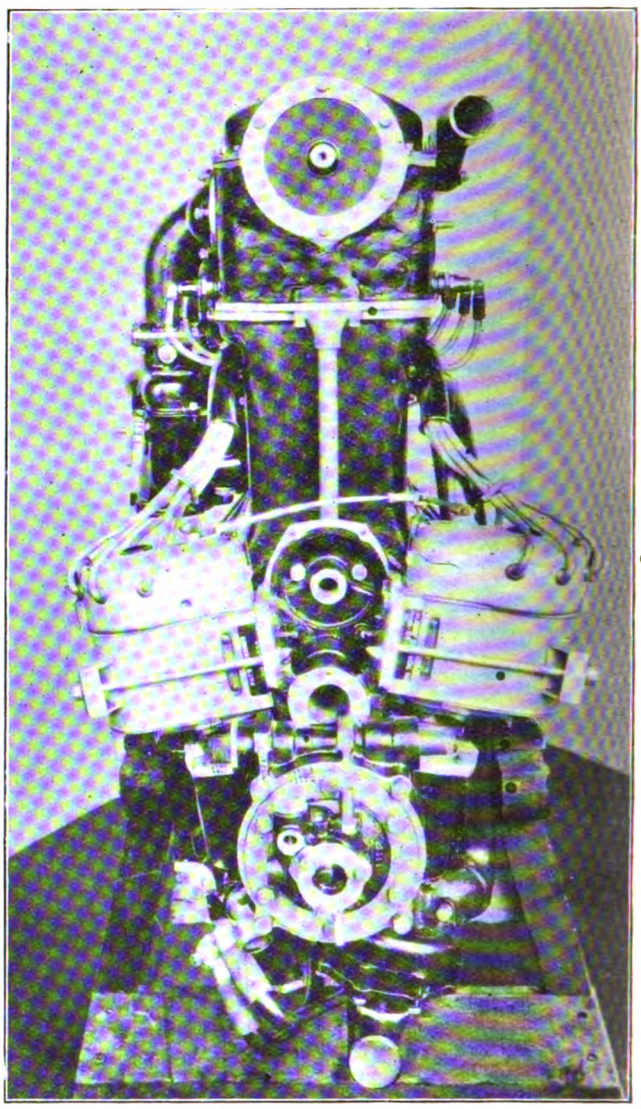
THE AEROMARINE TYPE N.A.L.

This is a conversion of the standard "Liberty" engine, which is fitted with Aeromarine type aluminium cylinder blocks with inserted steel liners. The block castings instead of being in one piece with the upper crankcase, half are attached by studs to the standard "Liberty" crankcase.

This new version of the "Liberty" is designed to develop 450 h.p., and the cylinder blocks have been so designed that they may be bored out for 5¼ in. dia. instead of 5 in. dia. sleeves.

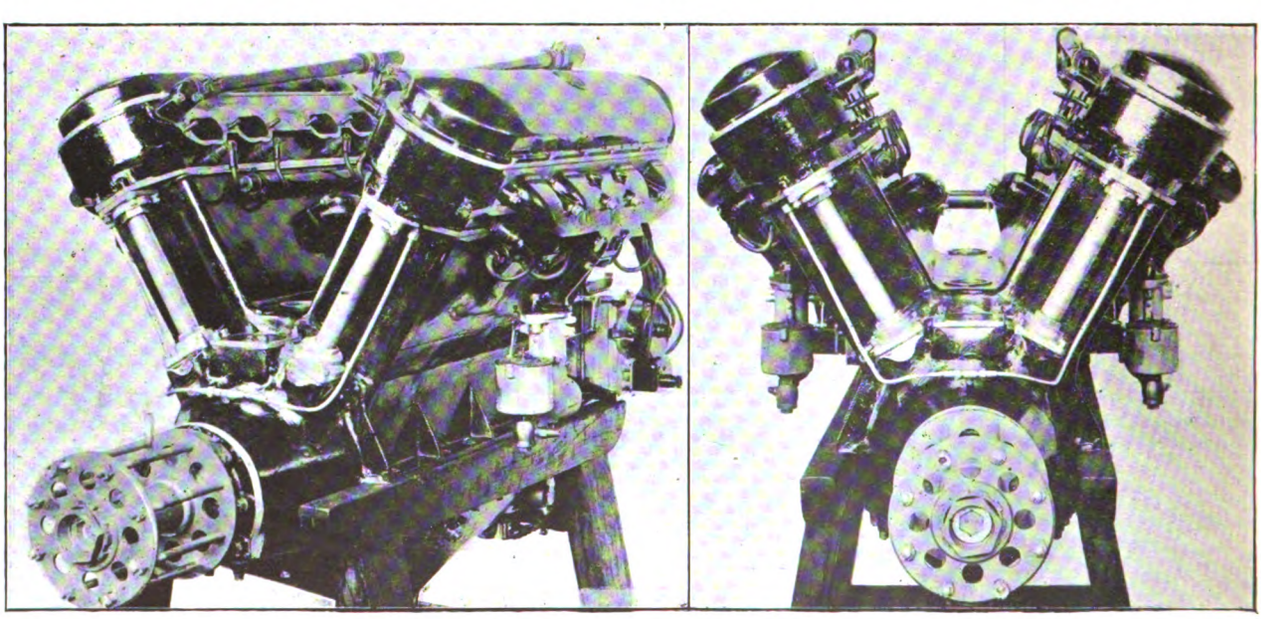
Specification of the Aeromarine N.A.L.

Bore	5 ins. (127 m/m.).
Stroke	7 ins. (178 m/m./.



The Aeromarine T-6 engine.

Compression ratio	5.4.
Overall length	70 ins. (1.778 m.).
Overall width	30 ins. (.762 m.).
Height above crank centre	30 ins. (.762 m.).
Rated h.p.	450 b.h.p. at 1,800 r.p.m.
Weight dry	915 lbs. (415 kgs.).



The Aeromarine type U-873 engine of 250 h.p.

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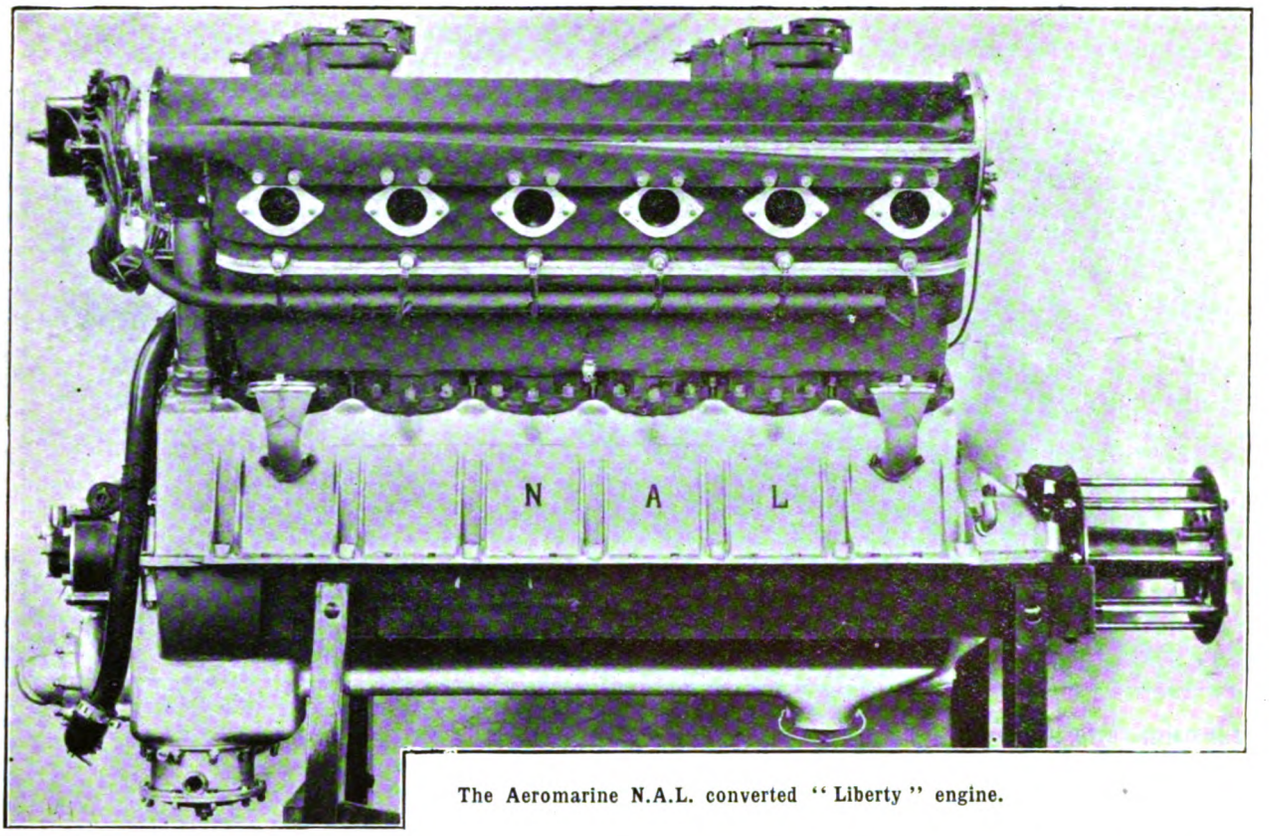


The Aeromarine N.A.L. converted "Liberty" engine.

CURTISS.

THE CURTISS AEROPLANE & MOTOR CORPORATION, Buffalo, New York.

In 1918 produced the K–6 and K–12 models, designed by Mr. Kirkham.

The feature of this engine was that the cylinders and the top part of the crank-case are cast of aluminium alloy in one unit.

Pressed steel cylinder-liners were used. The cylinder heads are cast in one unit and bolted to the top of the other casting.

These engines were described in the 1920 issue.

From these models the present Curtiss engines have been developed.

THE CURTISS D.12 ENGINE.

This engine, which leapt into fame as a result of its success in the Curtiss racing machines of 1921 and 1922, is a 12-cylinder "V" type with 60° angle between cylinders. Each row of six cylinders is cast in one block, which is bolted to the crankcase.

The cylinder sleeves—of steel—are screwed into an aluminium cylinder head, which is bolted down to the block casting. The sleeve-liners are of the closed top variety, with the valve seats machined in the top. The aluminium head casting contains the valve ports and guides. Four valves per cylinder are fitted.

The engine is notable for its extremely compact arrangement and clean outline. It is of abnormally small frontal area, and could be built into a fuselage of a cross-section too small to contain a normal pilot. It is also exceptionally light and has a very excellent reputation for reliability. The standard compression ratio is 5.3, but a higher ratio (5.8) is also supplied.

Specification.

Bore	4.5 ins. (114 m/m.).
Stroke	6.0 ins. (152 m/m.).
Length over all	$56\frac{3}{4}$ ins. (1.44 m.).
Width overall	$28\frac{1}{4}$ ins. (0.72 m.).
Height overall	$34\frac{3}{4}$ ins. (0.88 m.).
Output	400 h.p. at 2,000 r.p.m.
Fuel consumption, full throttle	0.53 lbs./h.p./hour.
Weight dry	680 lbs.

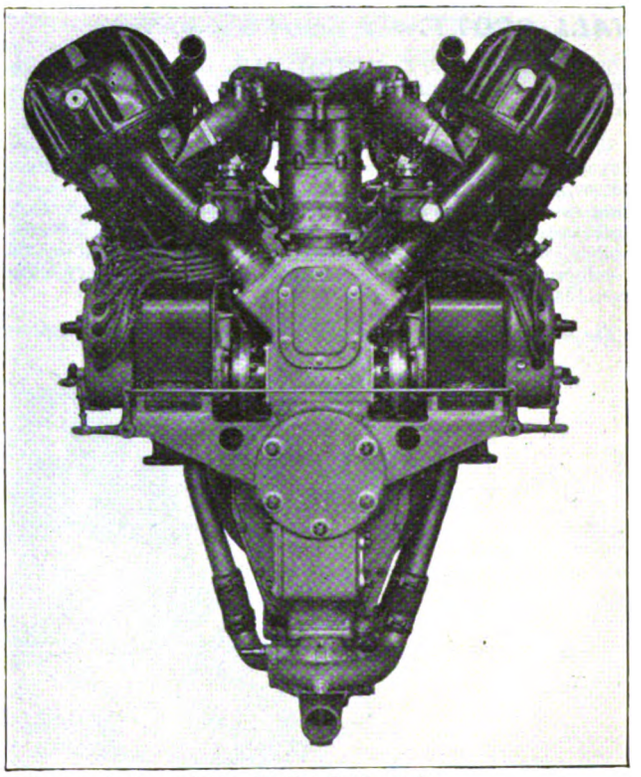
(These figures relate to the 5.3 compression ratio engine. The high compression type develops over 450 h.p.)

THE CURTISS D.12A.

This is the D.12 with cylinders bored out to $4\frac{5}{8}$ ins., which was fitted to 1923 Navy Curtiss racers—holders of the World's Speed Record. It develops 507 b.h.p. at 2,300 r.p.m., with a compression ratio of 5.8. In other respects it is identical with the D.12.

THE CURTISS C.6.

This is a 6-cylinder vertical engine with one cylinder-block of similar type and size to that used in the D.12.



Gear end view of the Curtiss D.12 engine.

Specification of the Curtiss C.6 Engine.

No. of cylinders	6.
Bore	$4\frac{1}{2}$ ins.
Stroke	6 ins.
B.H.P.	160.
R.P.M.	1,750.
Weight dry	420 lbs.
Weight of water in engine	19 lbs.
Compression ratio	5.2.
Petrol consumption	.5 lbs. per h.p. hour.
Oil consumption	.015 lbs. per h.p. hour.

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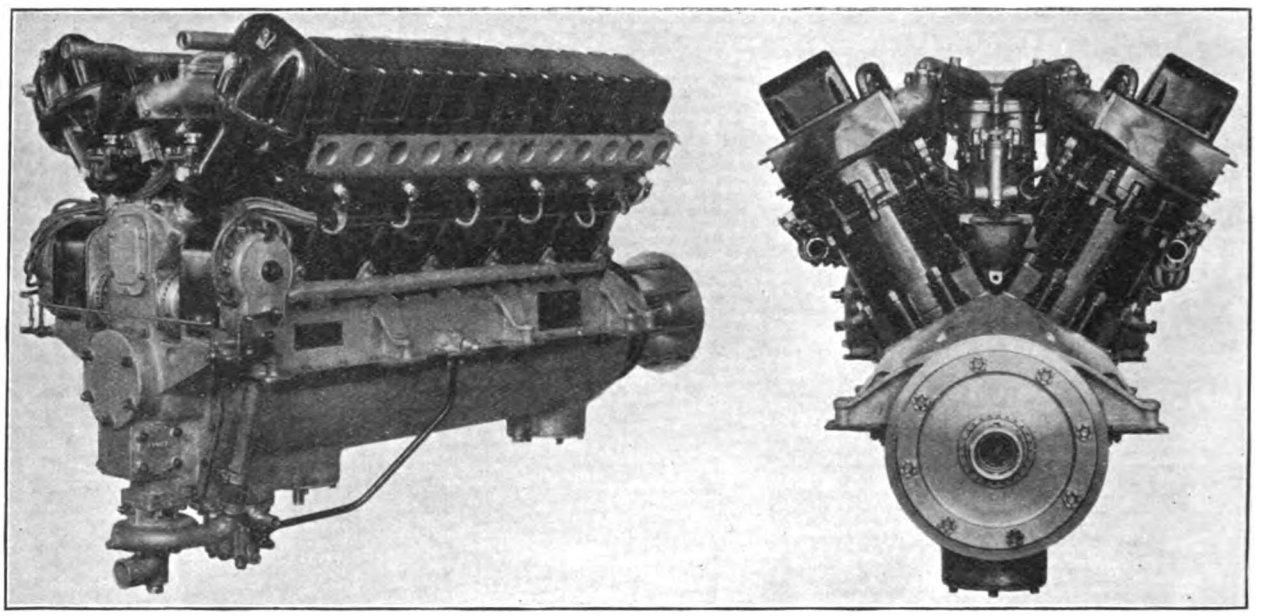
CURTISS—*continued.*



The Curtiss D.12 engine of 400 h.p.

HALL-SCOTT.

THE HALL-SCOTT MOTOR CAR Co., Inc. General Offices: Crocker Building, San Francisco. Works; Berkely, California.

The chief designer of the Hall-Scott Company, Lt.-Col. Hall, played a very large part in laying out the designs for the American Government's "Liberty" engine, and consequently that engine embodied a considerable number of features derived from Hall-Scott practice and experience. In return, in their post-war models, the Hall-Scott engines have benefitted from the development of the Liberty engine, and bear a very close resemblance thereto.

The firm has, however, abandoned the building of aero-engines.

LAWRANCE.

The Lawrence Aero Engine Corporation has amalgamated with the Wright Aeronautical Corporation. As a result, the Lawrance radial engines (J and L types) are now known as Wright radial engines.

LIBERTY.

The Aeromarine Plane & Motor Company and the Wright Aeronautical Corporation have built experimental cylinder blocks with a view to increasing the horsepower of the "Liberty" engine. The Air Service Engineering Division at McCook Field and the Loening Aeronautical Engineering Corporation are conducting experiments with an inverted type of "Liberty" engine. The results of this work are not yet available.

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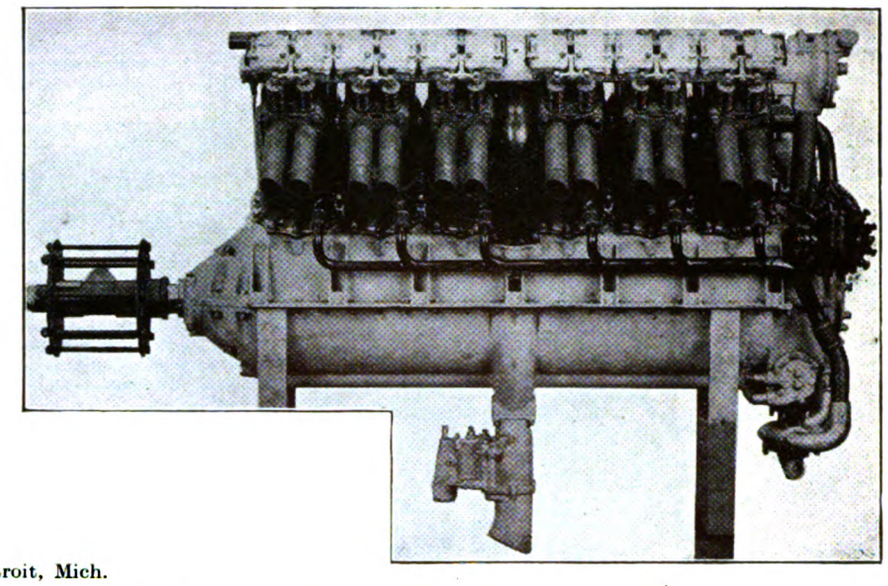
PACKARD.



The 600 h.p. 12-cylinder Packard Type 2025 aero-engine.

THE PACKARD MOTOR CO., Detroit, Mich.

The designer of the Packard engines, Col. J. G. Vincent, was one of those engineers concerned in the design of the Liberty engine, and since the cessation of hostilities the firm have produced a series of aero-engines bearing a great similarity to the Liberty ; but which it is claimed are distinct advances on that engine.

Characteristics of all these engines are that they are of the ungeared, high-speed type, with cylinders set at an included angle of 60 degs.

Steel cylinders, with welded-on water-jackets, very closely approximating to the Liberty in design, are used throughout, and generally the whole arrangement is similar.

The type 1-A.2025, of 500 h.p., is fitted with four valves per cylinder, the other types are content with the usual allowance.

Specifications of Packard Engines.

Type	1-A.2025.	1-A.825.	1-A.1116.
No. of cylinders	12.	8.	12.
Bore	5¾ ins.	5 ins.	4¾ ins.
Stroke	6½ ins.	5¼ ins.	5¼ ins.
Normal h.p.	580.	230.	270.
Normal r.p.m.	1,750.	1,800.	1,600.

The Packard Motor Car Company added in 1923 an airship engine to the different types of power plants it has built.

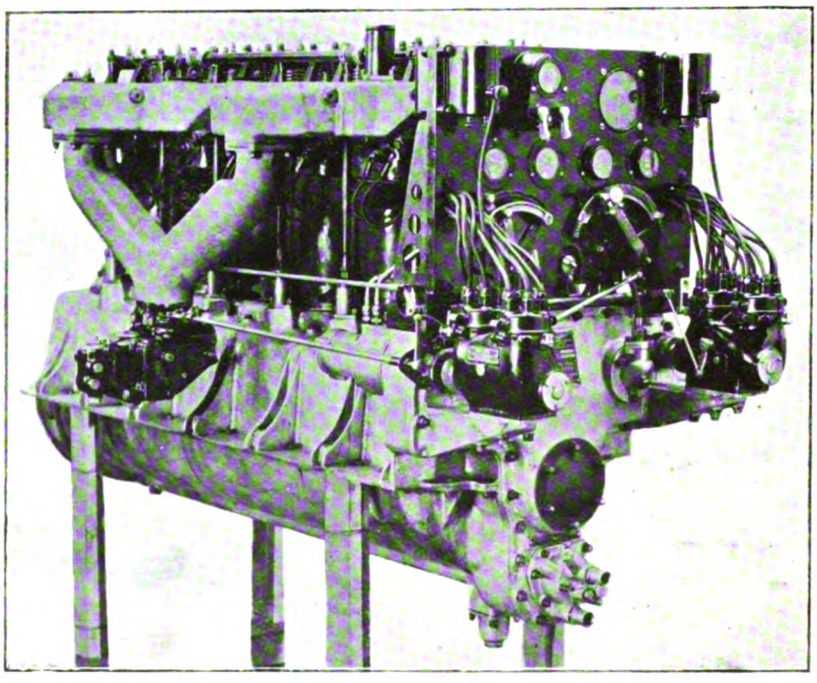
This engine, Model 1551, is rated 300 h.p. and is of the 6-cylinder in-line type.

The cylinders are steel forgings, with sheet metal water-jackets. The pistons are dye castings of aluminium alloy. The valves are of high grade tungsten steel and are operated by double rocker arms. The crankcase is an aluminium alloy casting. The crankshaft has seven main bearings. Ignition is by Delco system. Lubrication is by pressure.

Six engines of this model are fitted to the U.S. Naval Airship "Shenandoah."

Specifications of Packard Model 1551 Engine.

Type	6 cylinders in line.
Bore	6⅜ ins.
Stroke	7½ ins.
Normal h.p.	300.
Normal r.p.m.	1,400.
Piston displacement	1,551.24 cub. ins.
Compression ratio	6.5 : 1.
Fuel consumption	0.45 lbs. per b.h.p. hour.
Oil consumption	0.02 lbs. per b.h.p. hour.
Weight, dry, with instrument board and hand start	1,100 lbs.



The Packard airship engine (300 h.p.).

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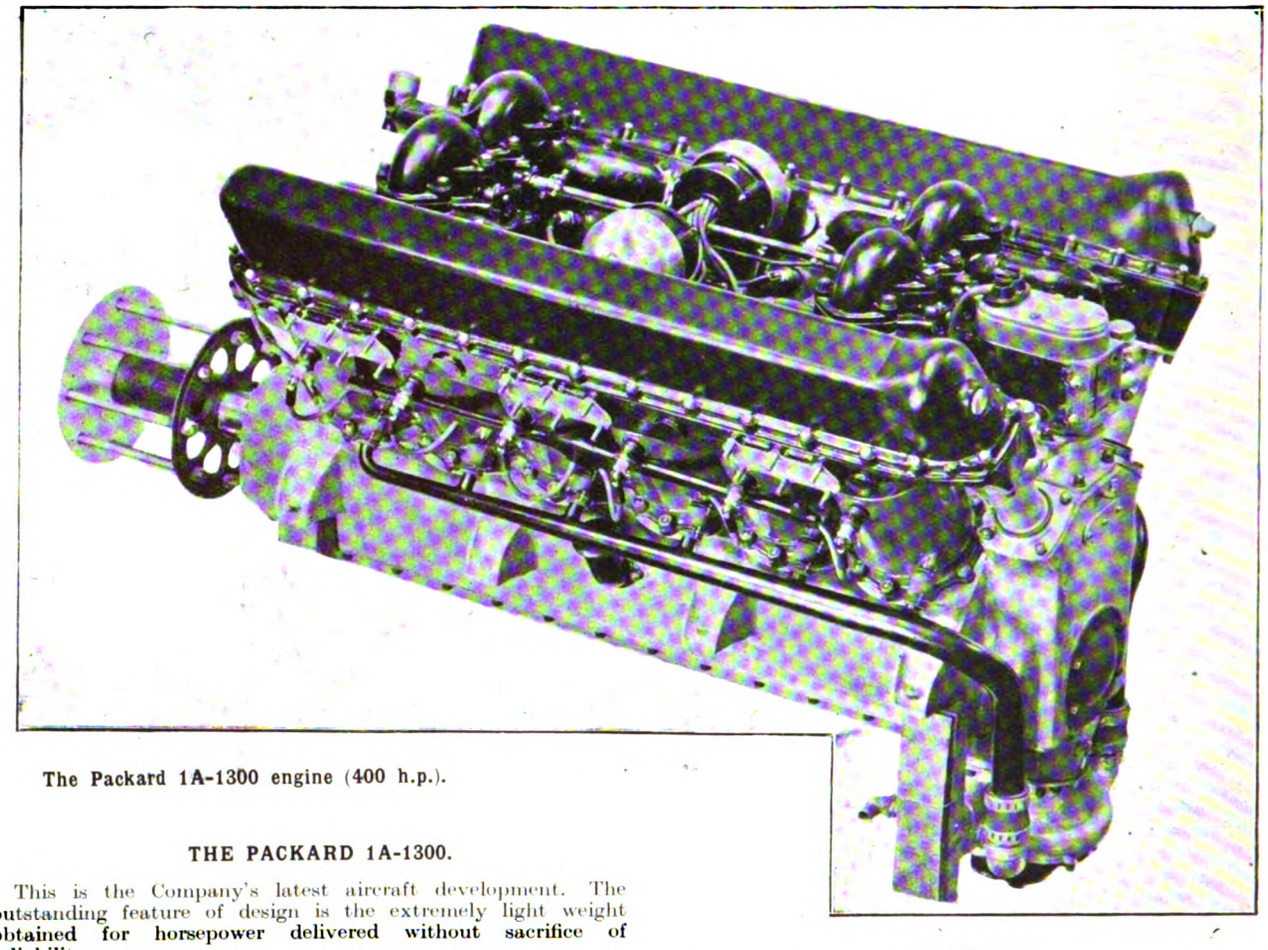
PACKARD—*continued.*



The Packard 1A-1300 engine (400 h.p.).

THE PACKARD 1A-1300.

This is the Company's latest aircraft development. The outstanding feature of design is the extremely light weight obtained for horsepower delivered without sacrifice of reliability.

Individual steel cylinders, which weigh nine pounds apiece, are tied together in banks of six at the top by an aluminium valve housing which carries the valves and the valve operating mechanism.

An especially interesting feature is the Packard-Dixie magneto, which gives two distinct sparks for each cylinder, and these sparks in no way are dependent on one another, entirely eliminating the necessity for two magnetos and saving over thirty pounds in weight.

The exhaust valves are oil-cooled through a hollow valve stem.

Specification.

Type	12-cylinder "V," 60° included angle, water-cooled.
Bore	$5\frac{1}{8}$ ins.
Stroke	$5\frac{1}{4}$ ins.
Horsepower	400 at 1,800 r.p.m.
Weight of engine dry	684 lbs.
Length overall	$59\frac{3}{8}$ ins.
Width overall	$26\frac{1}{4}$ ins.
Height above engine-bearers	$20\frac{29}{32}$ ins.
Fuel consumption	.50 lb. per h.p.h.
Oil consumption	.0025 lb. per h.p.h.

S.P.E.

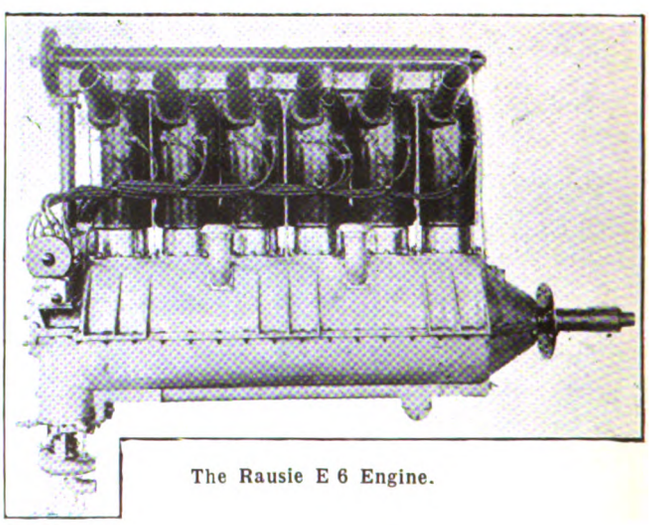
STEEL PRODUCTS ENGINEERING COMPANY, Springfield, Ohio.

In addition to the Rausie E 6, here illustrated, the firm has in hand designs for a series of larger engines, which are not yet built.

Specification of the Rausie E-6.

This engine is a straight line 6-cylinder 175 h.p. with overhead camshaft and valves. The cam gear is a patented device without rockers and runs in an oil-tight housing.

Bore and stroke	5 × 6 ins.
Displacement	707 cub. ins.
Compression ratio	$5\frac{1}{2}$ to 1.
Normal h.p. at 1,650	175.
Fuel consumption	.5 lbs. per h.p. hour.
Oil consumption	.0091 lbs. per h.p. hour.
Ignition	2 Dixie magnetos.
Carburation	2 Stromberg.
Main bearings	Integral in base.
Thrust bearing	Deep groove ball.
Weight of engine	525 lbs.



The Rausie E 6 Engine.

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S.P.E.—*continued.*

The Steel Products Engineering Company produced early in 1924 a "flat twin" engine specially for use on light aeroplanes. The engine was built from designs of Mr. Harold E. Morehouse.

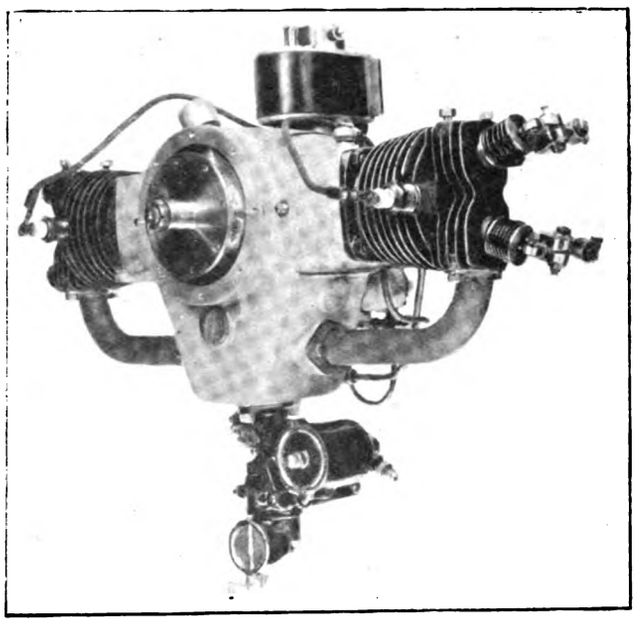
The cylinders are made of cast iron, with integral cooling flanges. Pistons are of aluminium. Valves are operated by pushrods and rockers. The crankcase is an aluminium casting. The crankshaft is of the two-throw, counterbalanced type. Lubrication is by pressure and splash systems. A Stromberg carburettor is used. Ignition is by Dixie magneto.

Specification of the S.P.E. Flat Twin Engine.

Type	2-cylinder horizontal opposed.
Bore	3 ins.
Stroke	3 ins.
Normal r.p.m.	2,000.
Normal b.h.p.	12.
Maximum r.p.m.	3,000.
Maximum b.h.p.	20.
Weight dry, without reduction gear	50 lbs.

Specification of 5-cylinder Radial Engine.

Rated h.p. at 1,800 r.p.m.	80.
Max. h.p. at 2,000 r.p.m.	95.
Overall diameter	37 ins.
Length from supporting flange to rear propeller hub	$12\frac{7}{16}$ ins.
Ignition	2—5-cylinder Dixie magnetos.
Carburettor	With altitude control.
Weight	196 lbs.



The S.P.E. Flat Twin, for light aeroplanes.

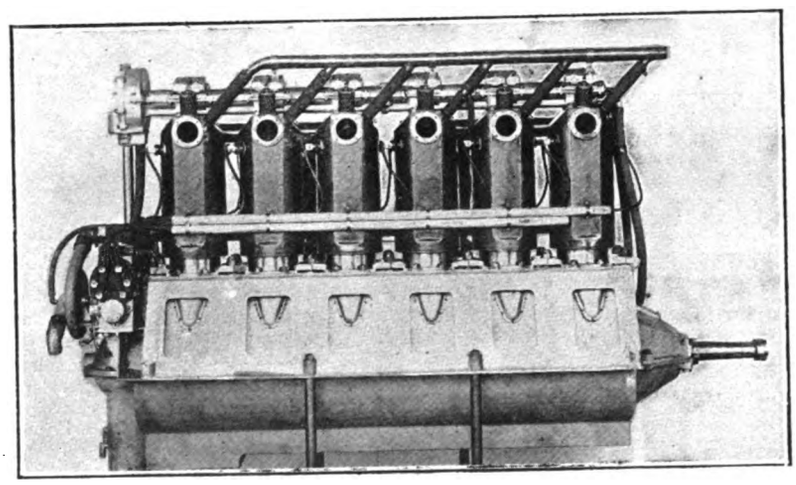
UNION.

THE UNION GAS ENGINE COMPANY, Oakland, California, U.S.A.

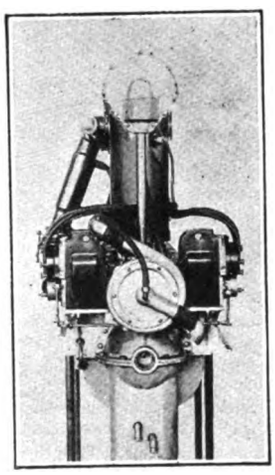
Make an excellent airship engine which has been adopted as a standard power plant for its airships. It is used exclusively on the D class airships.

Specification.

Brake horse-power	125 h.p. at 1,400 r.p.m.
No. of cylinders	6 vertical water-cooled.
Bore	$4\frac{3}{4}$ ins.
Stroke	$6\frac{1}{2}$ ins.
Steel cylinders	Copper water-jackets.
Valve gear	Overhead camshaft and rocker arms.
Lubrication	Force feed.
Ignition	2 Dixie or Berling magnetos.
Carburetters	2 Zenith.
Weight (including water piping)	485 lbs.
Weight per h.p.	3.88 lbs.
Fuel consumption per b.h.p.	0.558 lb.
Oil consumption per b.h.p.	0.0124 lb.



Exhaust Side of the Union Aero engine.



Pump End of the Union Aero engine.

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UNITED STATES AIR SERVICE.

Engineering Division, McCook Field.

The Engineers Division of the U.S. Army Air Service, at McCook Field, Dayton, Ohio, whose functions correspond to those of the British Royal Aircraft Establishment, have undertaken the development of high power engine units. A 700 h.p. Broad arrow engine was built and tested in 1921 and a similar type engine of 1,000 h.p. is under construction.

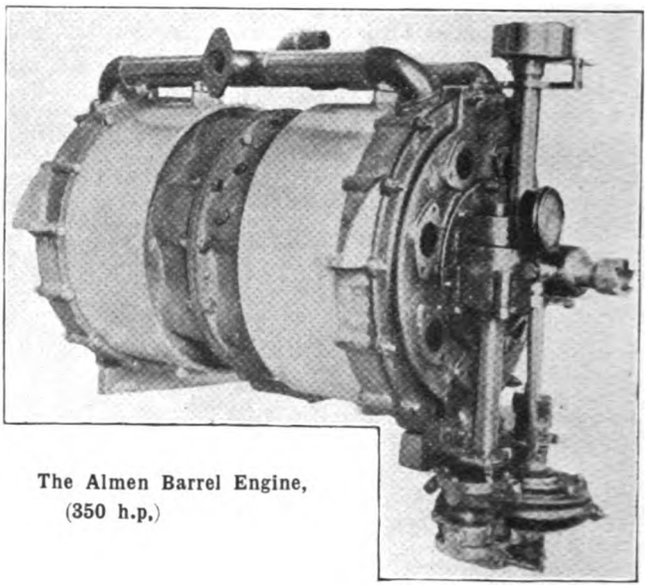
The cylinders are of steel with steel welded-on water-jackets, each with four valves in the head. Four spark plugs are to be fitted to each cylinder and four separate and independent 18-cylinder magnetos are to be fitted.

The engine is arranged for a direct airscrew drive, no reduction gear being fitted. 1,400 r.p.m. seems rather a high speed for an airscrew on an engine of this output, so that presumably the engine is destined for machines developing a high speed of flight.

A single cylinder unit of the proposed type has received fairly extensive tests with satisfactory results, and the authorities are satisfied that the proposed engine will develop its rated h.p. on a very low fuel consumption, and that the design will secure reliability and a low weight per h.p.

Specifications of the U.S. Engines.

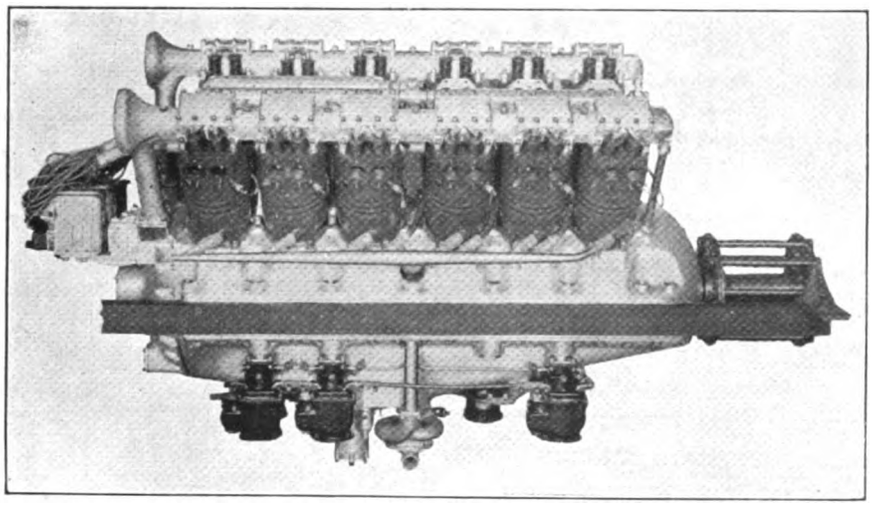
Model	E.D. 700	E.D. 1,000
Type	Broad arrow	Broad arrow
Included Angle	40°	40°
No. of cylinders	18	18
Bore	5½ ins.	6½ ins.
Stroke	6½ ins.	7½ ins.
Normal b.h.p	700	1,000
Normal r.p.m.	1,700	1,400



The Almen Barrel Engine, (350 h.p.)

THE ALMEN "BARREL ENGINE."

The Almen "Barrel" engine of 350 h.p., here illustrated, appears to have been developed by McCook Field. No data, except that the engine is 1ft. 6in. dia. by 3ft. 0in. long, and allows a "canon" to be fired through its centre, is yet available.



The U.S.A. 700 h.p. 18 cyl. Engine, (type E.D. 700).

An improved model of the "broad arrow" engine was built last year by the Air Service Engineering Division at Dayton. This engine has the same specifications as the 700 h.p. model described above, but develops approximately 800 h.p.

WRIGHT.

THE WRIGHT AERONAUTICAL CORPORATION, Paterson, New Jersey, U.S.A.

The Wright Aeronautical Corporation has now in production the following types of aero-engines :—

THE WRIGHT T-3 ENGINE.

The Wright type T-3 engine is of the 12-cylinder "V" type with an angle of 60° between the cylinders.

The T-3 engine differs from the T-2, which was described in the last volume, in detail only, the bore and stroke of the two engines being the same. Greater power has been obtained in the T-3 by an improved intake system. At the same time, smaller overall dimensions were secured by a careful redesign, so that the T-3 is 5 ins. shorter than the "Liberty."

The engine is designed round a crankshaft which is of particularly large diameter, which is carried entirely in the upper half of the crankcase by seven main bearings. A forged aluminium alloy is used for the caps of these bearings. The lower half of the crankcase serves to carry the pumps and oil strainers, but is otherwise simply an oil sump.

Each bank of six cylinders consists of two blocks, three cylinders each. The blocks are aluminium alloy castings. Steel liners, open at the top end, are held into the block castings by a short threaded portion at the top end. The liners are flanged at the lower end for attachment of the blocks to the crankcase. Combustion heads form part of the block castings, and the valves are seated in aluminium-bronze rings shrunk into the castings.

The overhead valve gears are completely enclosed in cam boxes, there being one such box for each bank of six cylinders. A single camshaft is used, with one pair of cams per cylinder, each cam operating two valves by means of a branched rocker arm. The whole valve mechanism is completely enclosed and pressure lubricated.

The carburettor and intake system form a single unit, which is placed in the V and can readily be removed.

All the accessory drives are fitted at the rear end of the engine, and are arranged on the unit system. Oil and water pumps form one assembly, and the camshaft and magneto drives another. All these gears are neatly housed and readily accessible.

It is claimed that with the block cylinder system used a much more rigid engine can be produced than is the case with separate cylinders, that the number of connections, particularly in the water system, is considerably reduced, and that it is

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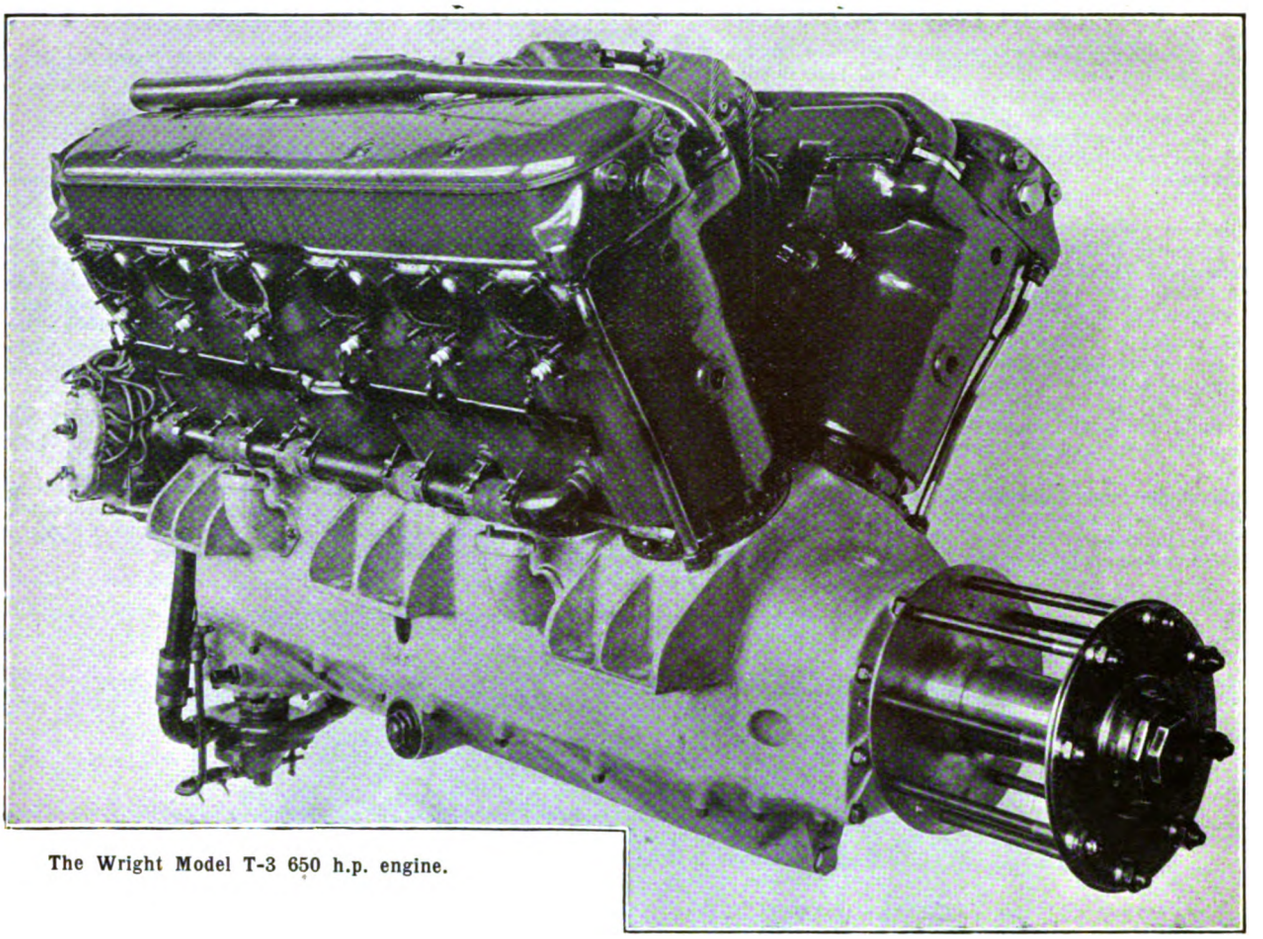
WRIGHT—*continued.*



The Wright Model T-3 650 h.p. engine.

much easier to dissemble or to reassemble the engine with this type of construction.

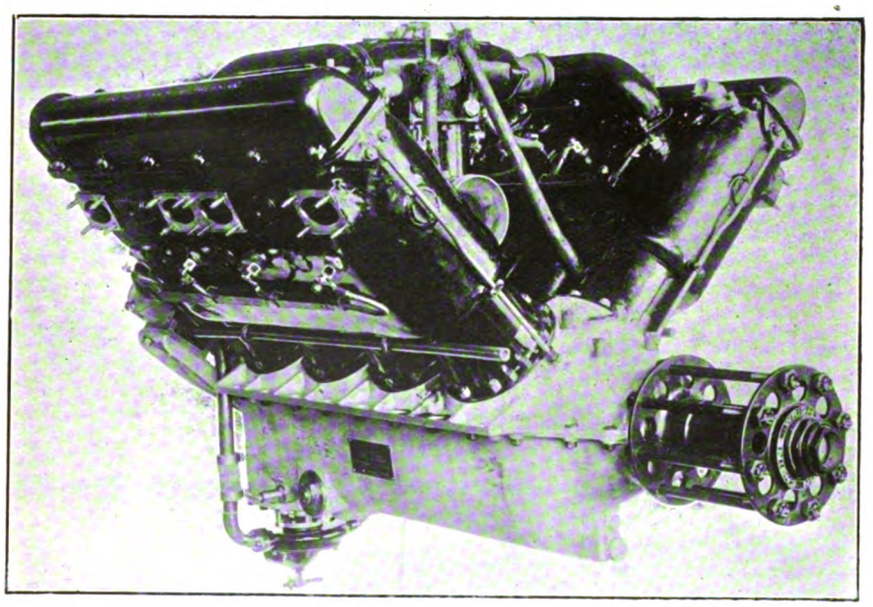
Very great care has been taken to make all parts of the engine accessible even when it is installed in an aeroplane—a matter of great importance in operation. All sparking plugs can be reached easily. The oil strainer and oil pressure release in the lower crankcase are easily accessible. The entire ignition system—including the wiring—can be quickly replaced.

The number of connections to be made on installation or broken on removal of the engine from an aeroplane has been reduced to a minimum. There is one "oil in" and one "oil out" coupling, one water inlet and two water outlets, a petrol supply joint, and an oil pressure connection.

Both on the camshaft drives and the magneto drives provision has been made to render timing of the engine as simple an operation as possible.

Externally the engine is extremely clean and neat in outline, and there is practically no oil leakage even over very long periods. The engine is economical in both oil and fuel, and in service consumption of under 0.5 lbs. of fuel per h.p. hour, and under half-a-gallon of oil per hour have been recorded.

The whole engine is built to a complete system of jigs and templates and practically no hand work enters into the manufacture, all bearing fits, etc., being attained by grinding. Consequently complete inter-changeability of parts is secured.



The Wright Model E.4 200 h.p. engine

Specification.

No. of cylinders	12.	
Bore	$5\frac{3}{4}$ ins. (146 m/m.).	
Stroke	$6\frac{1}{4}$ ins. (159 m/m.).	
Piston displacement	1,947 cub. ins. (31.0 litres)	
Compression ratios	5.25 : 1 and 6.5 : 1.	
Normal output	600, 675.	
Normal speed	1,000, 2,000.	
Fuel consumption at normal power	.48 to .54 lbs./h.p./hr.	
Oil consumption at normal power	.0010 lbs./h.p./hr.	
Maximum output	780 h.p. at 2,200 r.p.m.	
Weight, dry, with carburettors, magnetos, air-screw, hub & all necessary equipment	1,155 lbs.	
Weight, with reduction gear and equipment	1,280 lbs.	
	Direct Drive.	Geared.
Overall length	$58\frac{3}{16}$ ins.	$59\frac{1}{16}$ ins.
Overall width	$30\frac{7}{8}$ ins.	$30\frac{7}{8}$ ins.
Overall height	42 ins.	42 ins.

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WRIGHT—*continued.*

MODEL H3 ENGINE.

This is an 8-cylinder, water-cooled, 90° Vee engine, with a bore of 5.51 ins. and a stroke of 5.91 ins. The displacement is 1,125 cub. ins. The rated power is 390 h.p. at 2,100 r.p.m., with an average power of 400 h.p. at 2,100 r.p.m. The weight is 615 lbs. This engine is a development of the original Model H engine and is built for pursuit work only, having a weight ratio of 1.54 lb./h.p.

MODEL E4 ENGINE.

This is a water-cooled, 8-cylinder, 90° Vee type of engine, with cylinders 4.72 ins. bore and 5.11 ins. stroke, with a displacement of 718 cub. ins. The rated power is 190 h.p. at 1,800 r.p.m. The average power is 215 h.p. at 1,800 r.p.m. The weight, dry, is 480 lbs.

This engine is a development covering eight years' work in this country of the original Model A Hispano-Suiza engine. The engine has been so completely changed, that it is only similar to the original in displacement and crankshaft, practically everything else in the engine having been redesigned. One of these engines successfully passed the Navy's 300 hr. duration test.

This engine was primarily designed for a training plane engine, but owing to its good weight per horsepower it makes an excellent single-seater fighter or alert ship engine, as well as an excellent commercial power plant, owing to its durability. For special purposes, it is possible to obtain 275 h.p. from this engine.

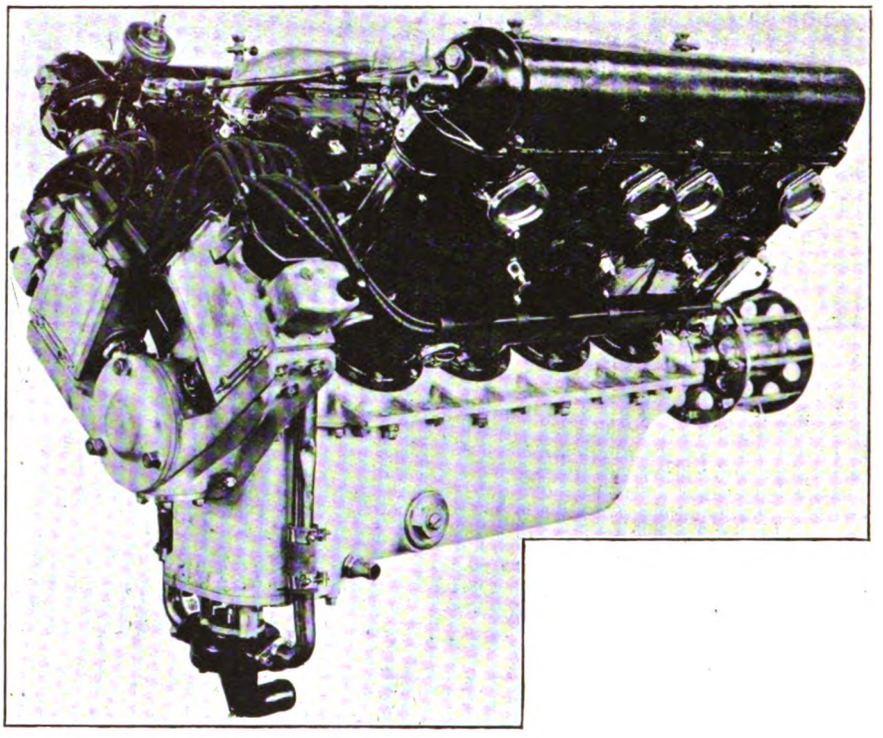
The TR3A float seaplane, which the U.S. Navy Department entered in the 1923 Schneider Cup race, was equipped with such a super-compressed E4 engine.

MODEL J3 ENGINE.

This is a 9-cylinder, air-cooled, fixed radial engine, of approximately 44 ins. diameter. It has a bore of 4.5 ins. and a stroke of 5.5 ins., with a displacement of 785 cub. ins. The rated power of this engine is 200 h.p. at 1,800 r.p.m. The average power is 220 h.p. The weight is 460 lbs. This engine is a development of the Lawrance J1, having a stronger crankshaft, larger propeller hub and a single double carburettor induction system instead of three separate carburettors, together with an entirely new lubricating system. An effort has been made to overcome all the small service difficulties that have been experienced with the J1 engines.

This engine was primarily designed for a training plane engine, but is also particularly adapted to single-seater fighters, as well as two-seater observation machines.

The Wright Model L4, 60 h.p., 3-cylinder radial air-cooled engine, which is used on many American sport aeroplanes, is no longer being manufactured. An improved model of somewhat higher horsepower is under development.



The Wright Type H engine of 400 h.p.

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PART D.

THE WORLD'S AIRSHIPS.

ARRANGED IN ALPHABETICAL ORDER

OF COUNTRIES.

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BRITISH AIRSHIPS.

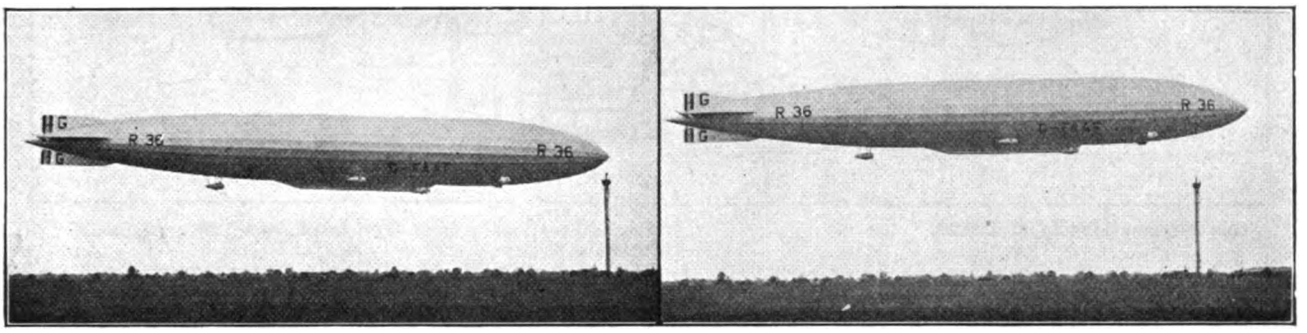
1923 was again a blank year in so far as airships are concerned in this country. After much discussion, the Conservative Government had practically decided to adopt the Burney scheme (mentioned in last year's volume) for the institution of an Imperial airship service, but the Conservative defeat at the polls in the election at the end of that year and the subsequent advent of a Labour Government, delayed the conclusion of negotiations on the subject.

In the spring of 1924, the new Government announced their decision not to proceed with the Burney scheme, but to take steps to the renewal of airship activities according to a scheme of their own.

Briefly, it is proposed that two new airships shall be built. One of these is to be of official design and construction specifically designed for naval reconnaissance. The other is to be ordered from the promoters of the Burney scheme and is to be designed for commercial purposes. The Government also proposes to provide on the route to India the necessary mooring masts, etc., to permit of operation over that route. The airship to be built by private interests, is to comply with specifications approved by the Air Ministry, and, subject to its passing the specified tests, the constructing interests are to be given an option to repurchase it from the Government at 75% of the contract price, in order that it may be operated experimentally over the Indian route.

The two proposed airships are to be of approximately 5,000,000 cubic feet capacity.

It is also proposed to recommission one or more of the now derelict rigids at Cardington and Pulham for training and experimental work.



R.36 at Pulham. The photograph on the left shows the ship riding at the mooring mast. On the right, she has just cast off and is rising.

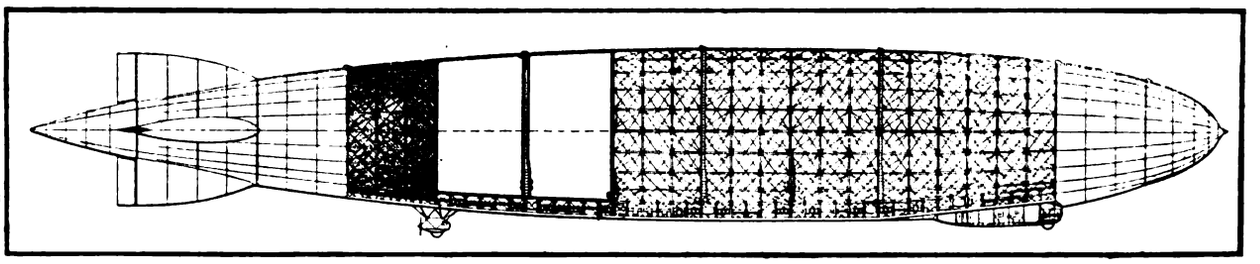
FRENCH AIRSHIPS.

French airship activities suffered a severe setback at the end of 1923 by the complete loss with all hands of the ex-German L72, rechristened "Dixmude."

This ship was sent out on an extensive cruise over the Mediterranean and the North of Africa towards the end of December. She fell in with extremely bad weather, apparently exhausted her fuel supply, and was wrecked on or about December 20th, off the coast of Sicily. The body of the Commanding Officer—Lt. du Plessis de Grenadan—was found, but so far as is known no other trace of the ship has ever been discovered.

For the rest, a certain amount of flying by old types of non-rigid ships has been continued, but no new types appear to have been produced. Neither can any authentic information as to projected new types be obtained. Nevertheless, the great new airship station at Orly, near Paris, continues to progress slowly, so that there is little doubt that eventually fresh French airship activities will have to be recorded.

GERMAN AIRSHIPS.



General Arrangement, LZ126 (2R3). (*Reproduced from "The Engineer."*)

The only airship activity to record during 1924 is the continuance of work on the L.Z.126, built by the Zeppelin Company for the Unites States on account of reparations. This ship—known to America as Z.R.3—was to have been completed late in 1923, but is now to be flown to America at some time during the summer of 1924.

L.Z. 126.

The design of L.Z.126 was limited by the restriction under the terms of peace of the size of German airships to 70,000 cubic metres (2,470,000 cubic feet), and the condition that no such ship should be equipped for military purposes.

Although, therefore, the displacement is very nearly the same as that of L.Z.104 (L.59), which was of 68,500 cub. m., the design of this new ship is considerably different from that of previous large Zeppelins. The overall length has been reduced from 226.5 m. to 200 m. and the maximum diameter has been increased to 27.64 m., as against 23.9 m. in the earlier ships. This decrease in slenderness, which was foreshadowed in the post-war passenger ships "Bodensee" and "Nordstern," leads not only to reduced resistance, but also reduces the structural difficulties encountered in airships of large size. The general construction of the ship, however, follows standard Zeppelin practice. The cross-section of the ship is a 24-sided

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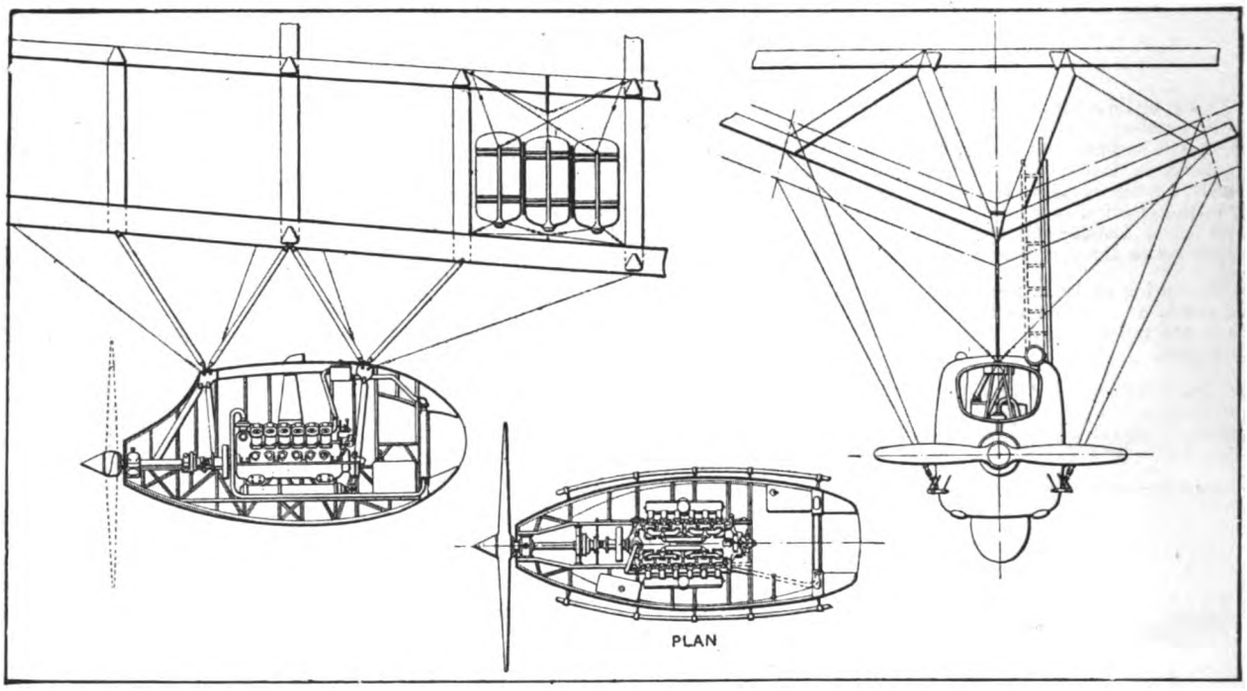


One Engine Gondola of LZ126. (*Reproduced from "The Engineer."*)

polygon, regular except at the bottom, where the figure is carried down by setting two ring segments on each side in line.

Main frame rings are spaced 15 m. apart and are stiffened by king-post bracing across pairs of segments and by the usual transverse wire bracing from alternate corners. Between each main frame, two unbraced rings are inserted at 5 m. apart. The actual girder construction, both of frames and of longitudinals, is the well-known triangular type.

The ship is fitted with a large central gondola forward, which contains the control room, a wireless cabin, commanding officer's cabin, five passenger cabins, each containing four bunks, together with kitchen and lavatory. Cooking, heating and lighting are provided electrically.

Accommodation for officers and crew, other than the commander, is arranged in the central corridor of the ship.

There are five engine gondolas, one on the centre line aft and two pairs side-by-side, between the after engine and the forward passenger and control car. These engine gondolas are supported by struts and wires in the usual manner.

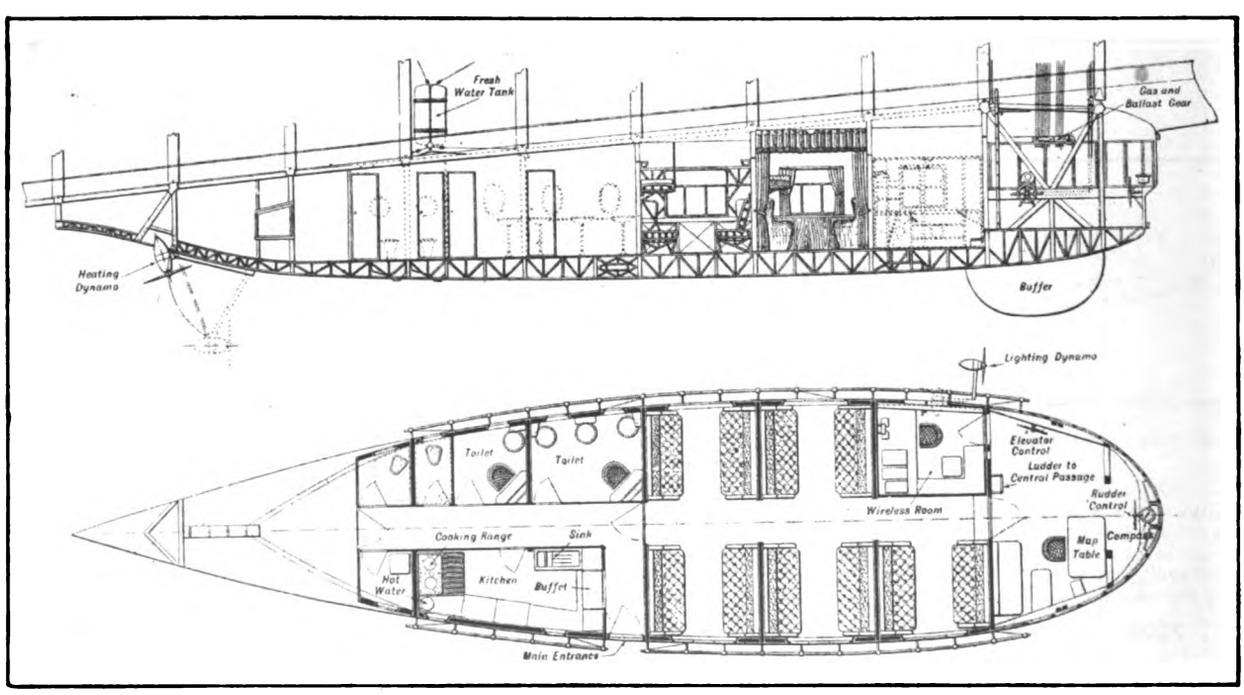
Each gondola contains one of the new 12-cylinder "V" Maybach engines of 400 h.p. fitted with engine reversing gear and a directly-driven pusher airscrew.

The tail consists of four cantilever fins (vertical and horizontal) with rudders and elevators attached. The rudders are unbalanced, the elevators have triangular balancing extensions at the tips.

Fuel is carried in the usual cylindrical tanks, stowed along the corridor, the total normal capacity being over 17 tons of petrol. Extra fuel tanks will be fitted for the flight to America.

Specification of L.Z.126.

Length	**200 m. (656 ft.).**
Max. dia.	**27.64 m. (90 ft. 6 in.).**
Max. height	**31 m. (102 ft.).**
Capacity	**70,000 sq. m. (2,470,000 cub. ft.).**
Gross lift	**81,300 kgs. (80 tons).**
Disposable lift	**41,000 kgs. (40 tons).**
Max. speed	**122 km.h. (76 m.p.h.).**
Cruising speed	**108 km.h. (67 m.p.h.).**
Radius at cruising speed	**78 hours = 8,400 km. (5,200 m.).**



The Control and Passenger Car of LZ126. (*Reproduced from "The Engineer."*)

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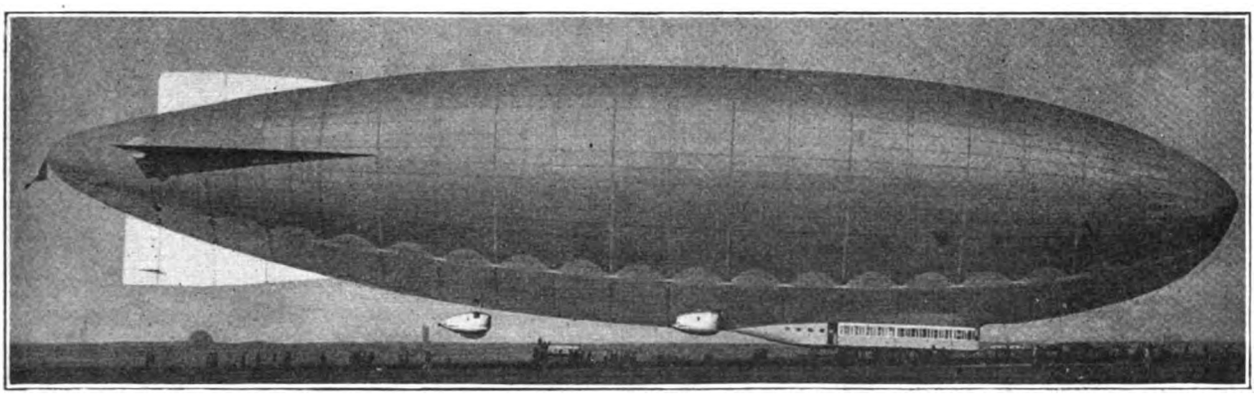
ITALIAN AIRSHIPS.



The Semi-rigid Italian Airship N.1 at Ciampino, the airship station between Rome and Frascati.

During 1923, the State Airship Factory at Rome, under the direction of Ing. Umberto Nobile, has continued the development of the semi-rigid type of airship. Actual completion seems to have been confined to the type N.1, hereafter described. Designs for much larger ships are, however, in readiness for the time when construction becomes possible.

THE N.1.

This airship, which was designed and built at the Italian State Airship Factory at Rome, under the direction of Ing. Umberto Nobile, is a development of the earlier type in which a pin-jointed triangular keel frame is used to relieve the envelope of compression loads, thus making it possible to use smaller gas pressures than would otherwise be necessary.

In N.1 the keel is extended fore and aft to form a rigid nose and tail structure, the tail stiffening serving to carry the stabilising and control surfaces. As is usual in this type of ship, the keel structure is attached to the envelope through a steel cable catenary system, which relieves the envelope fabric of a large proportion of the tensile stresses which it would otherwise have to carry.

The N.1 has been equipped as a passenger-carrier, and is fitted with one large combined control and passenger car mounted well forward. There is accommodation for 20 passengers in this car. Three engine nacelles, two side-by-side amidships and one below the keel aft, each carrying one 250 h.p. engine driving a propeller, are suspended from the keel by steel cables.

The main dimensions, etc., of the N.1 are :—

Capacity	**19,000 cub. m. (672,000 cub. ft.).**
Length	**106 m. (348 ft.).**
Max. height	**26 m. (85 ft. 4 in.).**
Max. width	**9.5 m. (64 ft.).**
Max. speed	**100 km.h. (62 m.p.h.).**
Useful cargo capacity	**8,000 kgs. (8 tons) appr.**

UNITED STATES AIRSHIPS.

At the present moment the United States bids fair to take the lead in the development of airships. Undeterred by the calamity to R.38, the American Navy during 1923 completed Z.R.1—now known as the "Shenandoah"—a rigid of Zeppelin type and of the general dimensions of the L.33 class. This ship has been flown to some considerable extent and appears to have been entirely successful, although trials have been delayed by an accident at the mooring mast.

Z.R.3 (L.Z.126), which is nearly complete at the Zeppelin works, is expected to fly to America in August, 1924. With these two rigids the American Navy propose to demonstrate the practical usefulness of the large rigid airship, both for naval reconnaissance work and for long distance civil transportation.

In regard to smaller types of airship, both the Navy and the Army are continuing along the lines which were outlined in the previous volume. Nothing notable in the way of new productions is on record, but the small service airships appear to have been in steady use with satisfactory results.

Outside of the Government services, it is to be recorded that the Goodyear Tyre & Rubber Co., of Akron, Ohio, who have so far been the largest builders of airships in the United States, have formed a subsidiary concern known as the Goodyear-Zeppelin Corporation, which has purchased all Zeppelin rights in America. This concern looks forward not merely to the construction of future Service airships, but also to the development of a very wide network of commercial airship services covering not only the whole of America, but eventually extending to Europe and Asia.

Z.R.1 ("SHENANDOAH").

Designed by the Bureau of Naval Aeronautics and constructed at the Naval Airship Station at Lakehurst, New Jersey, the Z.R.1 is an improved version of the Zeppelin L.33 and the British R.33 class, of which she is a very close duplicate in overall dimensions.

The ship is the first rigid to have been built in America and, as the actual construction has been entirely carried out since the end of the War, a very considerable amount of care has been taken to avoid sources of trouble known to have occurred in both the German and British predecessors.

The ship was completed in the summer of 1923 and made a number of very satisfactory flights. As a result, it was proposed to fly her to the North Pole in 1924. As a preliminary, she was subjected to exposure tests, in which she was to have been moored out for ten days in January and measurements of beam deflections and so on made to determine the stresses to which a moored ship was subject.

In the course of a violent gale on Jan. 12th, 1924, the top fin failed in a gust of 68 m.p.h. As a result, the ship rolled beyond the limit of free movement of the mooring pivot and the whole mooring fitting and part of the nose framing were wrenched out of the ship. The forward gas bag ripped and the following one was punctured. The nucleus crew aboard had four of the six engines running within two minutes of the break away, dropped fuel and water tanks to restore trim, and flew out the storm without further structural damage. The ship was housed in the shed after a few hours, the wind having dropped to 20 m.p.h., and repairs were at once put in hand.

The original cause of the trouble was undoubtedly the fin, and the tearing away of the ship cannot be considered as reflecting in any way on the general practicability of riding out violent storms at the mooring mast. On the other hand, the fact that the ship in its damaged condition rode out the storm without further failure speaks well for the vessel's airworthiness.

Specification of the Naval Airship ZR-1.

Type of airship	**Rigid.**
Purpose	**Naval Scouting.**
Capacity	**2,115,000 cub. ft. (60,000 cub. m.).**
No. of gas cells	**19.**
Overall length	**680 ft. (208 m.).**
Max. diameter	**78.7 ft. (24 m.).**
Max. height	**93 ft. (28.4 m.).**
Engines, type and h.p.	**6—300 h.p. Packard.**
Total h.p.	**1,800.**
Max. speed	**60 m.p.h. (97 km.h.).**
Crew	**23.**

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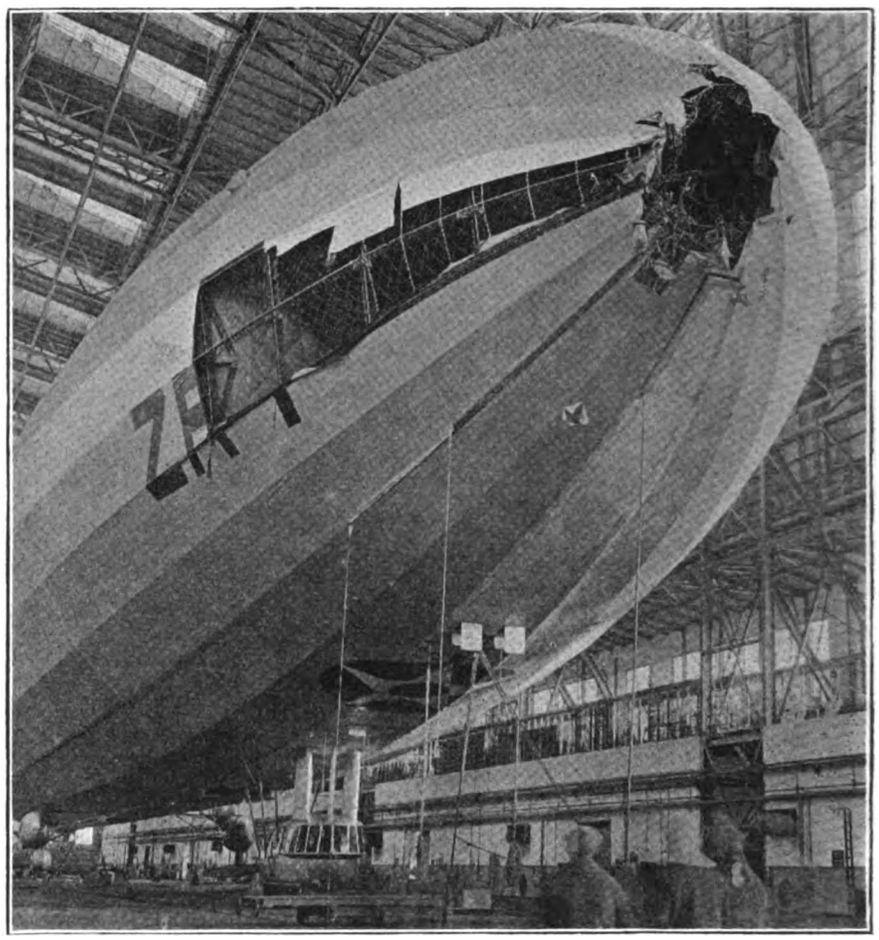
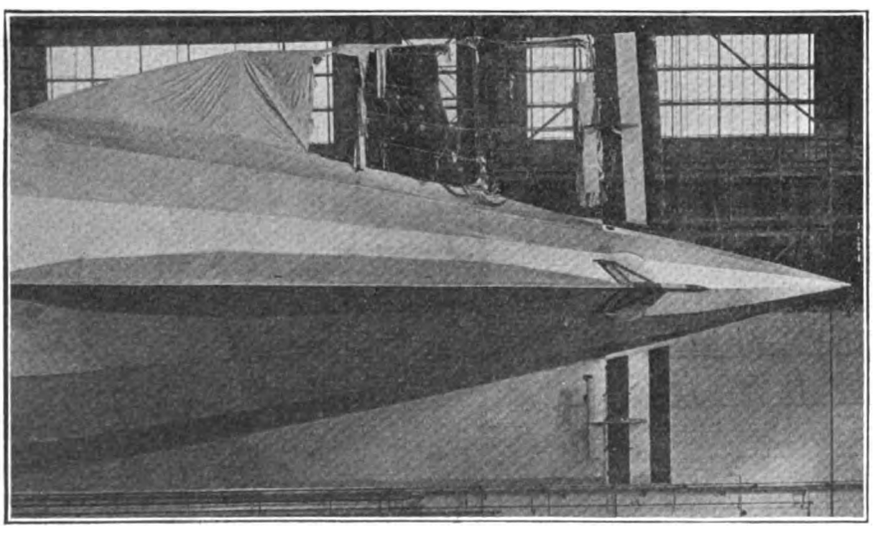
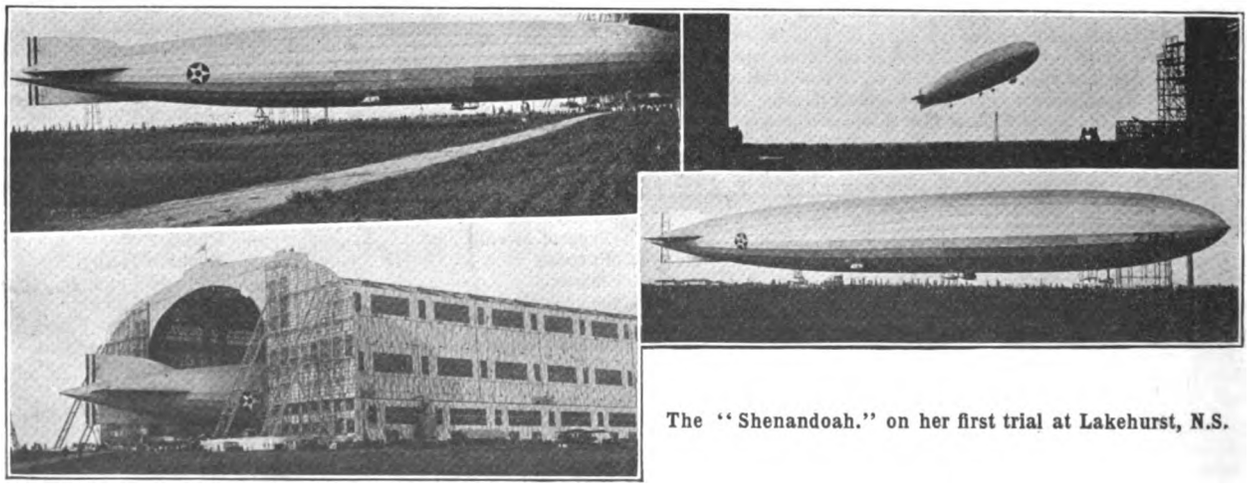
UNITED STATES AIRSHIPS.

The Nose of Z.R.1 ("Shenandoah") after breaking away from her mooring.





The Tail of the "Shenandoah" after the break away. The broken top fin, which caused the accident, can be seen.



The "Shenandoah." on her first trial at Lakehurst, N.S.

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TC TYPE.

As a result of the experience gathered from the extensive operation of the Class "C" and Class "D" non-rigid airships by the U.S. Army and Navy Air Services, an improved type, known as TC, was produced in 1923. The first three TC airships were built by the Goodyear Tyre & Rubber Company, of Akron (Ohio), for the Army Air Service, and the latter now has let an order for three more ships of this type with Airships, Incorporated, of Hammondsport (New York).

Specifications of TC Type Airship.

Type of airship	Non-rigid.
Purpose	Training and Patrol Work.
Capacity	200,600 cub. ft.
Length overall	195 ft. 9 in.
Max. diameter	42 ft.
Engines, type and h.p.	2 Wright, 150 h.p.
Full speed	60 m.p.h.
Range, full speed	1,070 miles.
Cruising speed	47 miles.
Range, cruising speed	1,630 miles.
Crew (hydrogen)	10 men.
Crew (helium)	6 men.

Helium will be used as the standard lifting gas in these airships.

RN TYPE.

The U.S. Army airship RN-1 was originally built by the Zodiac Company of France under the type designation ZD-US-1. Purchased by the American authorities during the War, the ship was not completed until after hostilities were over, when it was shipped to America. The ZD-US-1 was then assembled and used for training and experimental purposes at Langley Field. In 1923 the airship was renamed RN-1 and the Army Air Service let contracts for two spare envelopes, one each with Airships, Incorporated, and the Connecticut Aircraft Corporation, of Newhaven, Conn. During this year the ship was deflated and reassembled with its new envelope built by Airships, Inc. While the new envelope does not materially differ from the French original, the suspension connections and some other details were modified to conform more nearly with American practice.

Specification of U.S. Army Airship RN-1.

Type	Non-rigid.
Purpose	Training.
Capacity	340,000 cub. ft.
Length overall	262 ft.
Diameter	48 ft.
Height overall	70 ft.
Ballonnet	2 of 40,000 cub. ft. each.
Engines	2 Liberty (L.C.), 330 h.p.
Full speed	60 m.p.h.
Ceiling	10,000 ft.
Crew	12.

An interesting innovation on this ship is a fighting platform on top of the envelope, which is reached from the car through a vertical gun-shaft. This shaft is made of balloon fabric, with stiffening rings, each of which has a ladder rung. The shaft flares out at the top into the fighting platform, which accommodates a gunner and two observers. This "gun cage," as it is called, is 5 ft. in diameter and 3 ft. deep, and is built of very light spruce members and rings. A Lewis gun and a swivel seat for the gunner, complete the arrangement. When the gun cage is not in use, it is fitted with a fabric cover.

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Abbreviations:—Aust. = Austrian; Bel. = Belgian; Brit. = British; Ger. = German; Ital. = Italian; Jap. = Japanese; Rou. = Roumanian; Rus. = Russian

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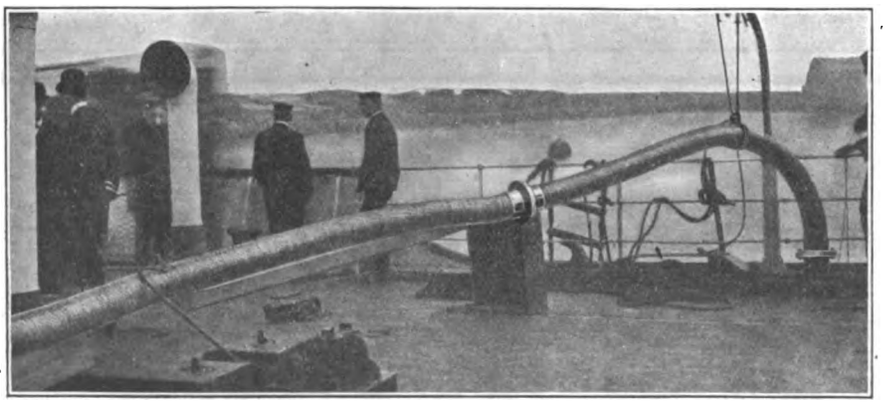
The Company are Contractors to the Admiralty, and supply large quantities of various sizes of Tubing up to 12 inch interior diameter for innumerable marine purposes. Amongst others, Fuelling Warships at sea and in port, Voice Tubing (Fire Control), Charging Torpedoes, Boiler Sweeping, etc., etc., and especially for highest steam pressures. Indestructible by action of sea water.

Voice Tubes, Exhaust, Speedometers, Petrol Pipes.



Flexible Metallic Tubing has become a necessity, and it is now employed in thousands of cases where rubber, which becomes charred and perishes at a comparatively low steam temperature, is absolutely useless. Oils of all description have no deterrent effect on Flexible Metallic Tubing.

"FLEXIBLE METALLIC TUBING"

FOR AVIATION PURPOSES.

44 adv.

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